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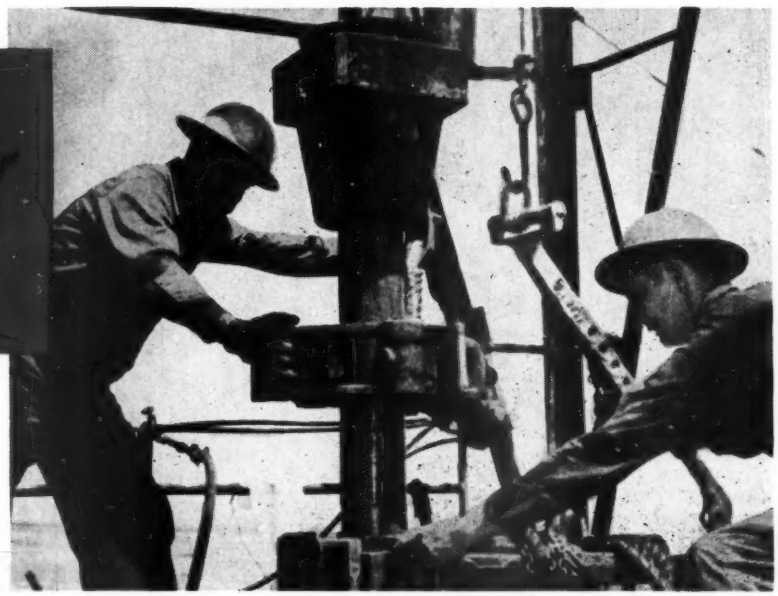
# the OIL AND GAS JOURNAL



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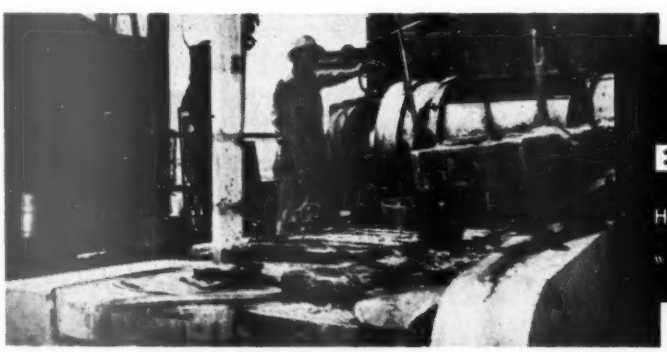

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TABLE OF CONTENTS PAGE 105

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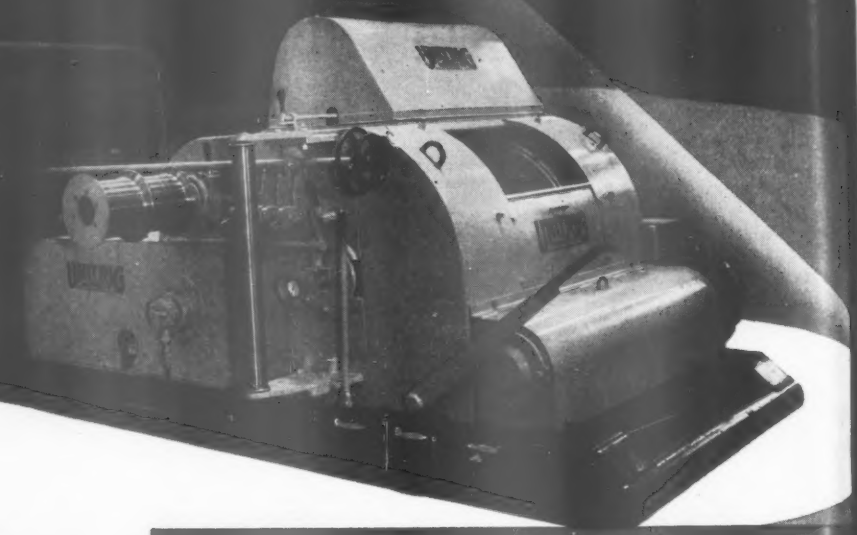

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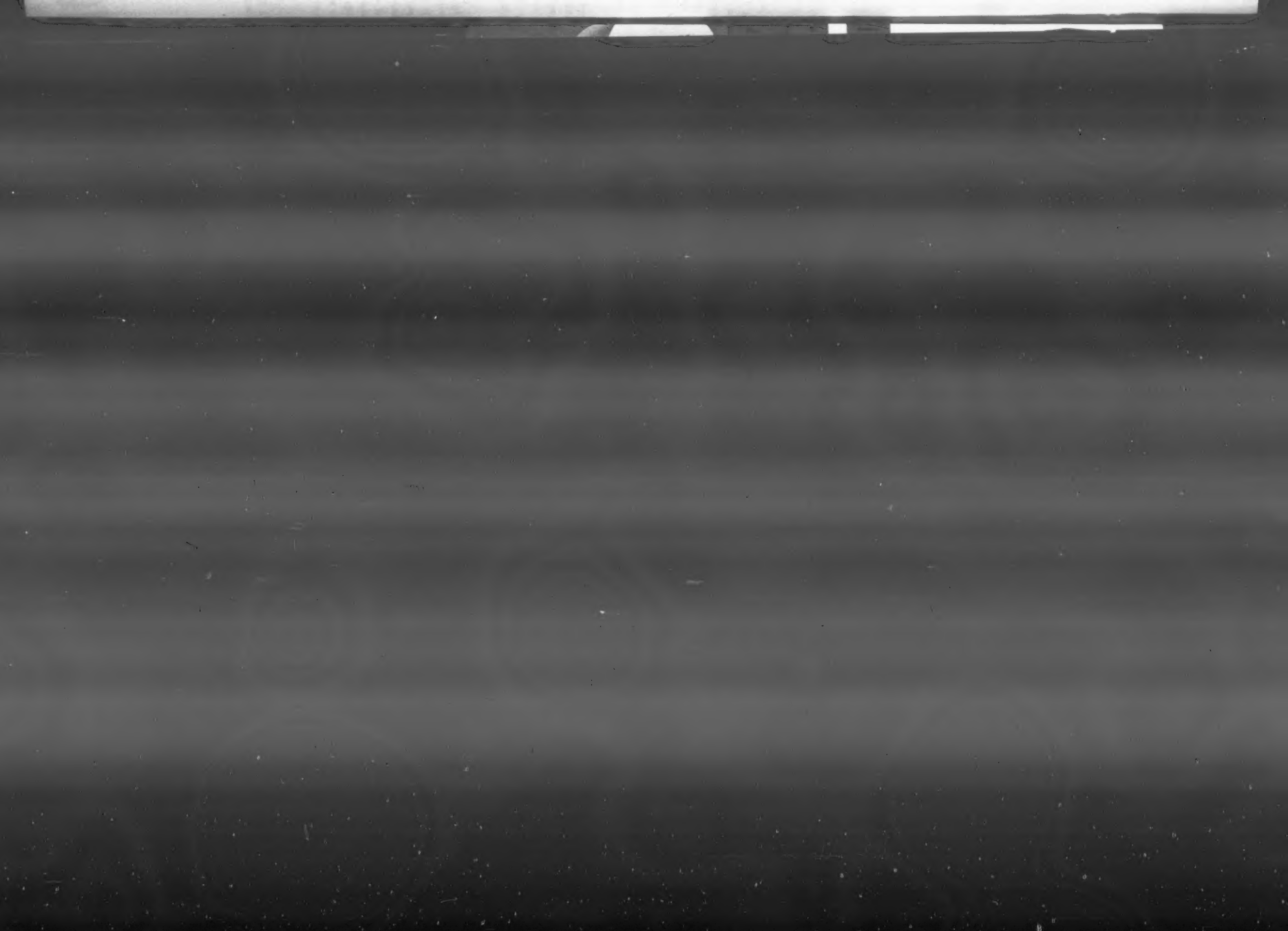

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## Table of Contents


### NEWS DEVELOPMENTS

Bitter Dispute Over Oil Matters Precipitates Ickes' Move .... 108
"Old Curmudgeon" Packs Drama Into His Sudden Departure 109
Natural-Gasoline Prices Slump; Refinery Motor Fuel Steadied 110
Consumer Will Have Innings at Chicago Natural-Gas Hearing 112
Foreign Trade Council Raps Restraints of Sterling Bloc ..... 113
Oil Industry Studying Ruling of Colombian Finance Control .. 113
Labor Troubles Dissolving as All But 21 Refineries Returned 114
Baker Objects to SPA Report on 100-Octane-Plant Disposal .. 115
Rumania's Product Rate Will Depend on Equipment Imports 115
Texas-Los Angeles Line Is Argued Before Commission ..... 116
International News ..... 119
Industry's Research Facilities Undergoing Expansion ..... 123
Industry Seeks Exclusion From Price Control ..... 124

Editorial ..... 107
This Week ..... 111
Deaths ..... 124
Natural-Gas News ..... 191
Natural-Gasoline News .. 191
Refining News ..... 194
Pipe-Line News ..... 197
Statistics and Trends ..... 200

### ENGINEERING AND OPERATING

Efficient Deep Development in Russell Field, West Texas ... 126
Practical Refrigeration for Natural-Gasoline Plants ..... 128
Pre-Permian Development in West Texas ..... 139
Personnel Training on a Repressuring Project ..... 147
Bearing Corrosion—Part 2 ..... 151
Book Reviews ..... 158
How to Inject Gas into Limestone-Dolomite Reservoirs ..... 161
Classification of Petroleum Reservoirs ..... 171
Progress in Metals ..... 178
The Refiner's Notebook ..... 189

### EXPLORATION AND DRILLING

Weekly Well-Completion Record ..... 200
Daily Average Production for Week ..... 201
Hatteras Test Gets Marine Section ..... 203
Reports by Areas Start on Page ..... 203
Summary of January Completions ..... 217

### ADDITIONAL FEATURES

Market Summary ..... 200
Crude-Oil Prices ..... 200
Calendar of Events ..... 217
Drilling Contractors ..... 218
Personals ..... 220
Equipment Men in News .. 222
Classified Advertising .... 223
Index to Advertisers ..... 226

# BAKER *Triplex* CEMENTING SHO

## Packs Off in Large Diameter, or Irregularly-Shaped Holes, and Retains Cement Slurry Above the Shoe

**WHAT IT WILL DO.** The Baker TRIPLEX Cementing Shoe basically is a casing shoe and operates as a conventional float shoe while running-in, washing and conditioning the hole. Its principal use is to retain all cement slurry above the shoe, thus protecting formations below from cement contamination.

All cement slurry is directed upward through side whirler ports; a sleeve-type, back-pressure valve prevents any return flow of slurry. The Baker Metal Petal Basket is intended to form a bridge, thus preventing cement slurry from settling into permeable, low-pressure zones below. The Basket is indispensable in large-diameter, or irregular-shaped holes.

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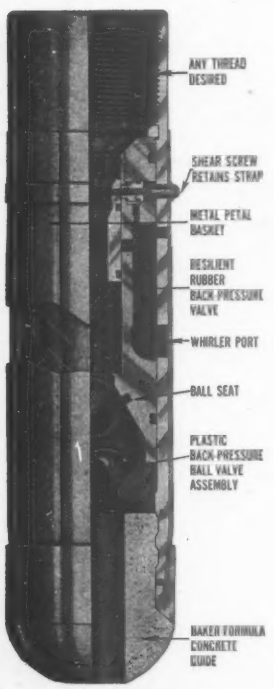
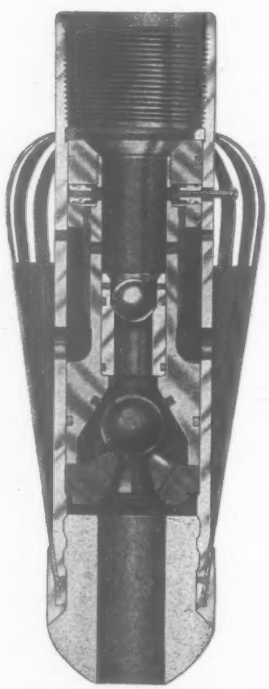
Then, after reaching the desired point in the hole, circulation is establish through the ample interior passageways of the shoe, and the hole is con tioned preparatory to cementing. The Tripping Ball now is pumped (or allow to gravitate) down the hole to seat upon the Tripping Valve. A press of 400 to 500 psi is applied to the casing which shears the screws in t Tripping Valve, permitting it to move downward and expose the cement ports. Shearing the screws also releases the hold-down strap around t basket, allowing the basket to expand outwardly against the wall of t hole. The cementing operation is then carried out in the conventional man with all cement slurry directed upward and held above the shoe by t expanded Baker Metal Petal Basket.



RUNNING-IN POSITION


EXPANDED POSITION

**STRONG, SIMPLE CONSTRUCTION.** The Baker TRIP Cementing Shoe consists of a whirler float shoe with a Baker Metal Pe Basket fastened on the shoe below the cementing ports. All cement slurry directed upward and retained above the shoe. A fabric reinforced, resili rubber, sleeve-type back-pressure valve opens readily to permit passage the slurry into the annulus above the shoe, but closes instantly to prev any return flow of slurry.

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**EASY TO ORDER AND USE.** When ordering the Baker T PLEX Cementing Shoe it is necessary to give only the size, weight and thr specifications of the casing upon which it is to be run. It is advisable furnish hole size, because (a) the TRIPLEX Shoe is approximately ½" lar than the O.D. of a standard casing coupling; and (b) the Metal Pe Basket must be of sufficient size to expand and pack-off even in large-dia eter and irregularly-shaped holes.

The use of a Baker TRIPLEX Cementing Shoe is no problem to experien cementers. Its effectiveness is evident from the demand from all active fie Contact your nearest Baker office or representative.

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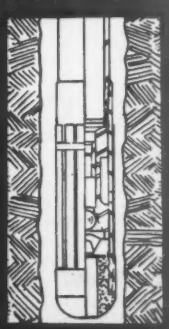
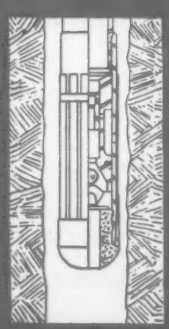
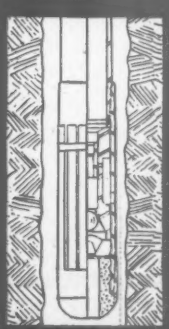
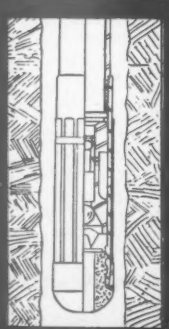
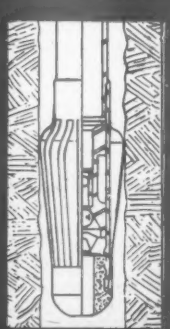

Floats Pipe


Pipe can be moved up . .


. . or down to desired position


Trip Ball dropped and seated


Tripping Valve down, Basket expanded

Slurry kept above shoe

THE OIL AND GAS JOURNAL

# Tidelands

UNFORTUNATE political developments must not be permitted to becloud the issues involved in the current proposals regarding tidelands. It would not be without precedent if, among the uninformed, an entirely erroneous concept of these matters affecting long-range public policy came from unfavorable publicity based on the political activities of individuals.

It is easy to become confused regarding the tideland proposals. The Government is endeavoring to establish legal possession to these lands through a favorable Supreme Court decision. A Senate bill, strongly supported by state officials, would end the federal claims to ownership of these lands where, in the past, state controls have not been in question.

As is invariably the case where there is federal tampering with established rights and practices the hearings on the Senate bill have revealed that the acquisition of tidelands would have far-reaching reactions on trade and industry. Title to submerged lands and the ownership of facilities used in water-borne commerce are involved. Fortunately, business interests outside the oil industry are beginning to realize these facts.

The main objectives of the proponents of a change in tideland ownership becomes apparent when they agree to waive many of these claims applying to existing channels of business. Their immediate plan in effect is to add these tidelands to the public domain controlled from Washington. The conservation of oil under these lands is the principal excuse offered in support of this policy.

Thus stripped of all subterfuge this proposal to build a federal wall along the shores of this country is nothing more than another project to extend government controls through the ownership of lands. Important additions to these vast lands were made during the war and the hold which the Government hopes to fasten more firmly in their operation is apparent from the plans that have been announced.

The contention that tidelands oil reserves should be conserved for future emergencies has been torn apart so often that it does not seem possible that it would seriously be offered in support of any extension of bureaucratic controls at this time. From the experience gained in two world wars it should be apparent to everyone that in an emergency this nation must depend on existing producing wells and operating plants and the "know how" and facilities of an aggressive and experienced industry and not the development of possible reserves lying beneath public lands. Tidelands under state controls and private operation have done their part in petroleum's accomplishments of war and peace and there is no condition in the making which justifies any change in their industrial position.

# Bitter Dispute Over Oil Matters Precipitates Ickes' Resignation

***by Henry D. Ralph***

WASHINGTON.—In one of the bitterest intraadministration rows seen in years, Harold L. Ickes resigned as Secretary of the Interior after a record-breaking tenure of 13 years, lacking 3 weeks.

Unfortunately for the oil industry, the cause of the break involved a government oil policy and the appointment of an oil man to an administration post. Ickes violently opposed the action of President Truman in nominating Edwin W. Pauley, California oil operator, as under secretary of the Navy because he felt no oil man should have charge of Naval petroleum reserves and because he claimed Pauley, while treasurer of the Democratic National Committee, had attempted to get the administration to drop its claims to submerged oil lands in return for substantial campaign contributions from oil men.

Ickes virtually accused the president and administration officials of asking him to commit perjury to secure Pauley's confirmation by the Senate. He also hinted that the administration is heading toward a repetition of the oil-politics scandals of the Harding administration. Ickes' explosion thereby greatly impaired the oil industry's relations with the public and with the Government, even though the industry as such is not directly involved in the mess.

President Truman reaffirmed his support of Pauley and immediately began looking for a new secretary of the interior. The bitterness with which Ickes left the administration doubtless means that there will be a complete shakeup in top noncivil service jobs in the Department of the Interior and that all Ickes appointees will leave before long. It also means that Ickes has lost whatever value he may have gained by his wartime service as liaison between the Government and the oil industry.

PAW itself is not directly affected but the incident may hasten the departure of remaining officials and speed final liquidation of this agency.

Ickes' lengthy letter of resignation disclosed that he had discussed the possibility of leaving the post at different occasions since the death of President Roosevelt last spring but that President Truman had asked him to remain until later this spring.

In his letter of resignation, which reached the White House February 12, Ickes suggested that he retain his post until March 31 so as to complete various pending matters and particularly to appear before the Senate foreign relations committee in support of the pending Anglo-American oil treaty. However, the president set the termination date as February 15, and on that day the 71-year-old self-styled "Curmudgeon" became a private citizen.

In one of the most colorful press conferences ever held in Washington, Ickes compounded his break with the Truman administration and he made it plain that he intends to take an active part in politics and public affairs. He has received offers to write for publication, and he is expected to remain in the public eye.

### Problems Are Posed

The departure of Ickes from the federal Government under normal circumstances would be viewed with satisfaction by the oil industry, but some immediate problems are posed by the conditions surrounding his violent resignation.

For years the oil industry was highly suspicious, and with good reasons, that Ickes had designs to bring oil under close federal control through the guise of conservation. All suspicions and animosities were buried during the war and Ickes and the industry worked together with amazing trust. But the truce ended with the war, and once again lines were forming for a battle over federal regulation of the oil industry. Despite the praise and credit due and given Ickes for his work as petroleum administrator, there is scarcely an oil man who is not relieved that he is no longer secretary of the interior.

However, the oil industry's relations with the general public are suffering from President Truman's appointment of Edwin W. Pauley to be under secretary of the Navy, and Ickes' attack on Pauley and the president. Because Pauley made a personal fortune out of business transactions pertaining to oil, and because Pauley's veracity and ethics are being attacked by "Honest Harold" Ickes, a large portion of the public appears to have the idea that oil and crooked politics somehow go together.

This makes it highly improbable that any man who has been connected with the oil industry, regardless of his integrity and ability, will be appointed to any high government position in the near future.

Ickes' letter of resignation also gave the impression that another major oil scandal is brewing such as ripped the Harding administration in the twenties. He referred to Teapot Dome and the Fall-Doheny contracts, spoke of "evidence that the political gnats in Washington are already swarming," and warned the president of "a cloud, now no bigger than a man's hand, that my experience sees in the sky." Ickes apparently had in mind pressure methods of raising campaign funds and the appointment of mediocre men to high government posts, but many newspaper readers jumped to the conclusion that there is some sort of scandal involving the Government and the oil industry.

This situation does not help the chances for Senate passage of the resolution to quiet the title of states to submerged lands, although the oil industry has taken no part in this controversy and the legislation is backed by the officials of many states with no oil lands whatever. Ickes opposes this legislation and Pauley favors it, and the resolution probably will be up for consideration by the Senate about the same time it is voting on the confirmation of Pauley. The Senate judiciary committee has completed hearings on this measure and is scheduled to make a report to the Senate in 2 or 3 weeks.

Ratification of the Anglo-American petroleum treaty may also be impaired by Ickes' resignation. Hearings on this are scheduled to open before the Senate committee on foreign relations on March 4, and Ickes was to have been the first witness. He may still appear as a private citizen and a former member of the delegation which negotiated the document, but his weight with the Senate may be considerably less now that he is no longer in office and has been, in his own view, repudiated by the president. Ickes originated the idea of the oil treaty, and the plan would have died but for his persistence.

State Department officials will support the treaty and so will Acting Petroleum Administrator Ralph K. Davies and several representatives of the oil industry. On the other hand the treaty will be opposed by a number of oil men. Without Ickes in a position to drive it through the Senate, the idea may arise that the treaty is just a row within the oil industry.

The activities of PAW have not as yet been dragged into the Ickes-Pauley-tidelands squabble. What is left of PAW apparently is not suffering from Ickes' departure. However, the incident probably kills any chances Davies may have had for an appointment to high government position—if he desired one. There appears to be considerable public endorsement of Ickes' idea that no active oil man should be appointed to a government post dealing with oil matters, although Ickes strongly defended his use of oil men in the war oil program and gave the highest praise to Davies.

# "Old Curmudgeon" Packs Drama Into His Sudden Departure

WASHINGTON.—Announcement of Ickes' resignation was the best "show" Washington correspondents have had since the NRA days of Gen. "Iron Pants" Hugh Johnson.

No falling out between administration members has been so dramatic, open, and bitter in many a year. The sharp-tongued "Old Curmudgeon" entered the ring without gloves, and pulled no punches. He used to the full his noted talents for sarcasm, bluntness, and repartee, and went down with his colors nailed to the mast.

Late on February 12 it was announced that the Secretary of the Interior would hold a "special" press conference the next morning, and word got around that it might be his last. As a result, more than 300 newsmen gathered for the occasion, far more than usually attend a White House press conference. Long before the scheduled time the secretary's conference room was so crowded that the meeting was moved to the department auditorium, which provided a much more dramatic setting.

Floodlights played on the stage with its background mural of a western desert. Newsreel men rigged special spotlights. Still photographers set up step-ladders for angle shots. Broadcasters adjusted microphones. More than half the 900 seats in the auditorium were filled, many of them by employes of the Department of the Interior, Petroleum Administration for War, Solid Fuels Administration, Coordinator of Fisheries, and other agencies headed by Ickes.

### Not a Tentative Resignation

The secretary entered with Mrs. Ickes, and she sat on the platform behind him throughout the conference. He announced that he was making available mimeographed copies of his 2,000-word letter of resignation. It was not a tentative resignation at all, he said, not one asking to be asked to stay.

The immediate cause was the Pauley incident, he said, and reporters gasped when he added, "I don't care to stay in an administration where I am expected to commit perjury for the sake of the party."

He reviewed his position on Pauley and his relationship with the President regarding the appointment, and then stood up under a barrage of questions.

One of the chief questioners was I. F. Stone, reporter for PM, who has frequently attacked Ickes for appointing Ralph K. Davies, vice president of Standard Oil Co. of California, as deputy petroleum administrator. Ickes told Stone his writings were "psychopathic and untruthful," that he was "in a continuous state of puzzlement," and that he "never could understand." He defended the use of Davies and other oil men in government positions dealing with oil in time of war, saying that when the government needs oil in an emergency it has the choice of getting advice from men who know how to produce oil or from PM.

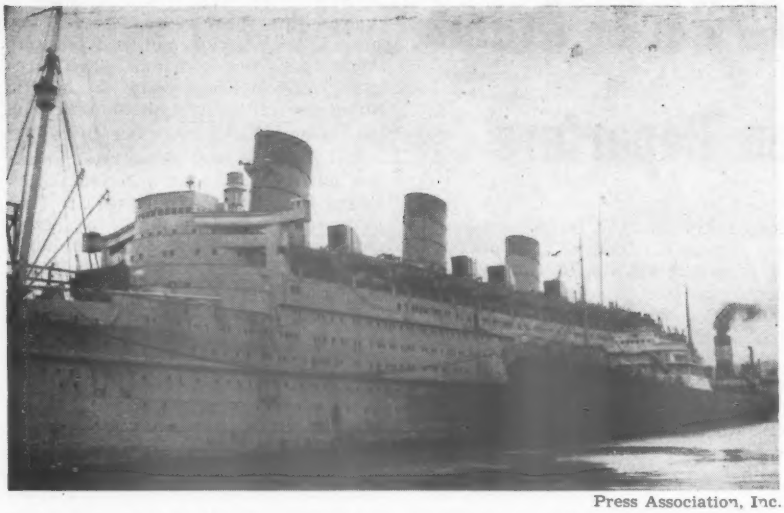
Ickes' press conferences have always been well attended because of his wont to make quotable comments on current political situations, and he was in rare form at his farewell appearance. Veteran political writers could recall few occasions when a retiring official has been so caustic about an administration of which he had been a part.

But his final barb came later in the day when he released a second letter to the President in reply to Mr. Truman's action in accepting his resignation effective February 15, whereas Ickes had asked to stay until March 31. In a single paragraph loaded with sarcasm, Ickes wrote the chief executive:

"I deeply appreciate the generosity and graciousness displayed in your letter of February 13. What particularly appeals to me is your statement, 'I also consider that this (my resignation) terminates all of your other activities.' You will pardon me if I remark that this is in the nature of supererogation. I assure you that I have had no secret design, having resigned as secretary of the interior, to hold on to any other office under your jurisdiction."

Harris & Ewing

*Candid camera studies of Harold L. Ickes taken during a press conference at which he announced his resignation from the cabinet as secretary of interior*



Press Association, Inc.

*Tanker pumps fuel oil into Queen Mary's storage tanks to expedite sailing of the mighty liner, delayed 2 days by the harbor-wide strike of tug-boat workers. More than 1,000,000 gal. of oil were pumped aboard*

# Natural-Gasoline Prices Slump But Refinery Motor Fuel Steadied

***by Dahl M. Duff***

NATURAL gasoline prices tumbled again during the week in the Oklahoma market, but oil men read hopeful signs into statistics showing declining refinery gasoline production with altered product yields.

In the week ending February 9, gasoline production dropped 987,000 bbl. to a total of 12,854,000 bbl., and stocks slowed their upward climb, increasing 194,000 bbl.—smallest since last autumn's strike.

Gasoline yields for the same week stood at 40.7 per cent on a national basis. This is the lowest gasoline-crude ratio since July 1943. Yields from crude rose to 48.2 per cent last November.

The more sensitive natural-gasoline market reacted again to cutbacks in gasoline production with another ½-cent decline. In the Oklahoma Group 3 area, the product was quoted at 3 cents, lowest since July 28, 1942, and indications were it might drop further.

Problems of natural-gasoline manufacturers are further complicated by the fact that their highly volatile product is less capable of storage than gasoline. Although export sales helped, they were not enough to arrest the downward price movement. Many natural-gasoline operators maintain only 5-day storage facilities and the price of the product quickly responds to unfavorable market influences.

The 4¾-cent ceiling on natural gasoline broke last April. Quotations have fallen since that time. Fluctuations in the market are shown by figures of the yearly average low: 3.1633 in 1939; 1.9253 in 1940; 3.6849 in 1941; 3.2052 iln 1942; 4.1257 in 1943; 4.7500 in 1944, and 4.4659 in 1945.

Relatively mild weather leading to greater gasoline consumption, the drop in production, as well as other factors contributed to steadying the refinery gasoline market throughout the central section of the country. Quotation of major refiners in north central section stood at 5⅜ cents, and one refiner observed that there seems to be less "cheap" gasoline offered. In northwest Texas, western Kansas, and New Mexico, gasoline was firm at 6 cents.

Burning oils continued in short supply. One refiner reported being 4 and 5 days behind in orders, others as much as 3 weeks. A plant with 20,000 bbl. normally on hand at this time of the year inventoried less than 1,000 bbl. In Westchester County, New York, the county health commissioner reported storage depots had no reserves of No. 6 oil for heating large buildings and only 3 days' supply of No. 2 for residences.

Although gasoline production was off, crude output climbed close to high wartime levels, and the week found oil men closely watching the outcome of this week's hearings of the Texas Railroad Commission to set allowable figures.

A reduction of 300,000 bbl. in daily allowable in Texas was advocated by Ernest O. Thompson, railroad commission member. Even this, he added, "may not be enough," Some sentiment for cutting allowables also appeared to be developing in other producing states.

Overproduction of crude has resulted in huge gasoline stocks with a consequent sagging market, Thompson said. "It should be borne in mind," he asserted, "that even under price control there is no floor on the price of crude oil or products. There are ceilings only. Oil has not been permitted to go up in price, but, if there is an oversupply allowed to be produced, there is nothing to prevent the price of crude from going down."

### Texas May Bear Reduction

Texas fields with higher gas-oil ratios seem likely to bear the reduction in allowable. In advocating reduction of allowables, Thompson said "the time is at hand to reexamine the question of flaring gas produced as an incident to the flow of crude, and it seems that fields with the higher ratios should be reduced in their oil allowables."

On February 25 Kansas Corporation Commission will set March market demand for crude. At the same time, the commission will hear evidence on the proposal to cut minimum well allowable back to the prewar 15-bbl. rating and to decrease acreage attributable to prorated wells to 20 acres.

In the East wholesale gasoline prices were following the reduction announced earlier by Socony-Vacuum Oil Co., Inc. Prices were lowered in amounts ranging up to 0.3 cent in New York and New England areas. Standard Oil Co. of New Jersey met the action with similar reductions in a 10-state area. Gulf Coast and lower Mississippi River market areas reported refinery gasoline prices are showing effects of the weakness that brought an ⅛-cent drop in the north central section last month.

The Pacific Coast market was sluggish and unchanged this week. Fuel-oil prices were firm, and the draft on stocks continued. Gas-oil demand has been good but only limited quantities are moving in the open market. Most of the available supply has been sold under contract or conditioned on an exchange of products. An ample supply of crude oil appears available, but refiners are unable to dispose of low grades of gasoline at reasonable prices. One major marketer brought out a new lubricating oil some time ago which the company claims requires changing only twice yearly.

# THIS WEEK

**POLITICS**— Ickes' resignation met with mixed emotions among oil men. . . . All regret that oil policy and a personal dispute with an oil man were the immediate causes. . . . Industry's favor with public cannot be helped by such controversies, likely to suffer. . . . ¶Termination of Ickes' cabinet standing may depreciate chances for Senate ratification of Anglo-American oil agreement. . . . Ralph K. Davies will shoulder major burden in presenting petroleum treaty, starting March 4. . . . ¶Real test of Ickes' congressional influence will come with the voting on Edwin W. Pauley's nomination for Undersecretary of Navy. . . .

**PRICES**— Bill extending OPA and price control affords another chance to exclude crude oil and petroleum products. . . . Excessive gasoline stocks and high crude production work against price increase, even if ceilings are removed. . . . ¶Industry advisory committee report to OPA understood to recommend higher crude prices. . . . OPA's refinery advisory committee expected to propose exactly opposite policy. . . . Economic Stabilizer Bowles fighting hard against higher consumer prices. . . . Refiners fear price ceilings, higher wages and more expensive crude would precipitate prohibitive conditions. . . . Smaller plant operators are talking about lower crude prices, not higher. . . .

**SUPPLIES**— Need becoming more critical for Navy special fuel on Pacific Coast. . . . Refiners asked to specify what additional supplies would result from higher prices. . . . ¶OPA considering higher ceilings for residual products in all districts. . . . Railroads and utility companies oppose higher ceilings but refiners cannot change yields materially without price relief. . . . ¶State allowables for March will have important bearing on stability of crude markets and refinery operations.

**LABOR**— Navy returning plants to private management at accelerated rate as wage increase of 18 per cent becomes general. . . . Some refiners still balk at C.I.O. demands for job classification and maintenance of membership. . . . ¶Settlement of steel strike insures materials for oil industry's expansion programs. . . . Bit shortage will be modified speedily, flow of tubular goods resumed before inventories are exhausted. . . . ¶Automobile production expected to hit postwar stride in near future, aiding to release pressure of exorbitant motor-fuel stocks. . . .

**NATURAL GAS**— Consumers have inning before Federal Power Commission in Chicago hearings this week. . . . ¶Mississippi supports Texas in urging FPC to keep out of producing, gathering and field-price affairs. . . . ¶Hearings opened before FPC on West Texas-California gas line. . . . ¶Texas Railroad Commission becoming more aggressive in conserving gas. . . . Fields with high gas-oil ratio may be curbed. . . . ¶At least a dozen pressure-maintenance projects have been confirmed by Texas operating companies in past 2 weeks. . . .

**REFINING**— Product yields responding to higher prices for distillate fuel oil and kerosene. . . . Gasoline output tapering off slightly. . . . Runs to stills remain high. . . . ¶Industry and government representatives discuss federal gasoline specifications, seeking middle ground for differences. . . . ¶Navy disclosing technical data on German plant investigations, chiefly concerning Fischer-Tropsch.

*The Bancroft Hotel in Saginaw, Mich., where Michigan's first commercial oil field was developed in 1925 to pioneer the state's now-profitable oil industry, operates to this day what is believed the only oil well of its kind in the country. Hotel Manager William J. Schill and Chief Engineer Paul Yelsik are shown here making a minor repair on the old 1 Bancroft Hotel Co., drilled in October 1927. Originally having a 35-bbl.-a-day capacity, the "oldtimer" now is so enfeebled it yields a meager 2 bbl. a day. The well has become such a hotel fixture officials say it will not be plugged until major repairs are necessary*

# Consumer Will Have Innings at Chicago Natural-Gas Hearing

THE natural-gas consumer is scheduled to be given a chance to present his views this week in Chicago on the widely opposed question of federal regulation of the industry.

The Federal Power Commission turned to this phase in its lengthy investigation after a comparatively brief hearing in Biloxi, Miss., where renewed opposition to the so-called "end use" regulation theory was developed. The Chicago hearing, due to open February 19 in the Circuit Court of Appeals courtroom, 1212 Lake Shore Drive, is the first in the gas-consuming northern section.

In Biloxi last week, Mississippi's Gov. Thomas L. Bailey shifted from the generally defensive position of state officials at other hearings with a suggestion that the federal Natural Gas Act be amended to exclude FPC from infringing on production, gathering, price, and use.

Louisiana, which fought gas exportation at its own hearing a month ago in Baton Rouge, joined with a railroad representative at Biloxi to challenge Mississippi's assertion that it has abundant reserves of gas.

E. Leland Richardson, assistant attorney general of Louisiana, told the commission that Mississippi would be forced to import coal and "chop wood" for its fuel if unrestricted exportation of its gas continues. Earlier, H. M. Morse, supervisor of the Mississippi Oil and Gas Board said he favors building a pipe line from Mississippi to West Virginia.

The extent of both proved and yet undiscovered reserves of Mississippi gas was pictured by Morse in his testimony. A recent report, he said, placed remaining recoverable reserves in Mississippi as of January 1 at 859,827,490,000 cu. ft., with 75,000,000,000 cu. ft. being oil-field gas and the remainder free or merchantable gas.

Morse departed from his prepared text to say that recent discoveries since the first of the year have increased this estimate to nearly 2 trillion cubic feet.

"The reserve estimate is conservative for the reason that the actual proved (drilled) area of the various reservoirs was considered, and the fact that none of the fields, with the exception of Amory and Jackson, have been delimited by drilling," he continued. "Too, during the first 2 weeks of January there was discovered two new fields in Adams County which may rival any of the other discoveries to date.

"Newer discoveries of natural gas now under development in Mississippi are related to deeper drilling. As a general rule, pressure and temperature in oil and gas reservoirs increase with depth . . . and hydrocarbons nominally liquid at atmospheric conditions become a gas only—in many instances."

At the request of Burton Behling, chief FPC investigator in the fact-finding hearings, Morse gave 3 trillion cubic feet as an "optimistic estimate" of the state's gas reserves, and added this will increase with time. However, Morse said an earlier statement by Governor Bailey that the state has proved reserves for 793 years of consumption reflects only current consumption of Mississippi gas in Misssissippi and was not intended to apply to total consumption in the state which imports much gas from Louisiana.

At the request of the Louisiana assistant attorney general, Morse gave names of the Mississippi oil and gas board's advisory committee which recommended the policy of free competition without federal controls. Of the 45 members, 28 were oil and gas men, several from Louisiana and Texas, but Morse asserted the governor knew "all these companies and men had large interests in the state and it was necessary that the best possible talent be gathered . . ."

William M. Vaughey, independent producer of Jackson, in an appearance at the hearing reiterated the view that only expanding markets will result in an increase in the field gas price and declared producers fear federal regulation as a result of seeing the Office of Price Administration's action in holding down crude prices.

# Scientists, Engineers Disapprove Revised Kilgore Research Foundation Bill

OPPOSITION to the revised Kilgore "National Research Foundation" bill No. S.B. 1720 is as strong apparently as it was against the original bill, S.B. 1297. Crux of the opposition is the fact that all control and direction of the Foundation is vested in political appointees by the President. These appointees are selected in the identical manner employed in the selection of political appointees such as ambassadors, cabinet members, consuls, etc. Senator Kilgore revised his bill presumably in the light of hearings held by his subcommittee following the strong opposition to his original bill.

The establishment of a National Research Foundation was suggested by Vannevar Bush in his report to the President. The principle of such a Foundation has been approved by America's leading scientists and technologists. Kilgore's bill provides that the Foundation be controlled and directed by an administrator "appointed by the President by and with the advice of the Senate."

The bill does not provide the Senate with any limiting power over the appointment; Senate merely can "advise" the President, throwing still greater ultimate power of the President's office in the control of this important organization. On the other hand the Magnuson bill, introduced immediately after presentation of the Bush report and which is approved by most of the engineering fraternity, provides that "duties and powers of the Foundation shall be exercised by a Board of Nine Members, appointed by the President." They are to be chosen without regard to political affiliation, solely for ability to carry out the Foundation's purposes. The board chooses its own chairman and vice chairman, appoints and prescribes the duties of the Director of the Foundation who, **"subject to the supervision of the board,** shall be the principal officer of the Foundation."

In the Kilgore bill, the President also appoints the deputy administrator. The functions of the Foundation shall be prescribed by the administrator. The latter also appoints the heads (directors) of each division, giving the administrator practically dictatorial control over the entire organization and its work.

Civil Service rules govern the selection of employes except when the administrator déems it necessary to select employes without regard to Civil Service.

An advisory board is to be selected by the President, "By and with the consent of the Senate," which board has no power to direct or control the administrator, being merely advisory in purpose, which advice the administrator is not bound to follow. Of 55 men testifying before Kilgore's subcommittee, only 23 want a single, politically appointed administrator, while 32 want the Foundation controlled by a board of qualified men.

# Foreign Trade Council Raps Restraints of Sterling Bloc

NEW YORK.—Stating that the continued operation of the sterling bloc, in the Middle East, "eliminates normal competition in matters of price and quality on which sound trade should be based," the current report of the National Foreign Trade Council on the "United States Commercial Position in the Middle East," adds that "the demand for American goods, even of those deemed essential for the maintenance of the economy of the country, can only be partly satisfied."

Moreover, the report points out that the uncertainties brought about by the current situation—wherein the scarcity of dollars is aggravated by the sterling bloc—impede the orderly development by American firms of the full potentialities of trade within the area.

In the development of oil resources in the Middle Eastern area, there is and has been constant competition among the great powers, all of whom are interested in obtaining or increasing concessions for the exploitation of the oil fields in the area, the report states, adding:

"That American companies are there is a tribute to our Department of State's insistence upon the open-door policy. Private American firms have taken full advantage of the opportunity thus afforded and now hold a strong position in the area. Foreign competition, however, is keen and governmentally directed and supported. This fact plainly indicates the urgent need for the strongest possible support of independent American business by the United States Government."

While the amount of dollars made available for each country is strictly limited, "the issuance of import permits for goods to be supplied from sterling sources is most liberal and applications for exchange are encouraged even to the extent of contracts running 1 or 2 years in the future," the report explains, stating further:

"Meanwhile the import demands for neither consumer goods nor capital goods is being satisfied and the resultant dissatisfaction is showing itself in various forms of political unrest."

Reportedly, there is no apparent disposition among the authorities in the Middle East countries to anticipate the terms of the proposed Anglo-American Financial Agreement requiring the dissolution of the dollar pool. In fact the British authorities claim that the amount of dollars allocated to the Middle East countries in the sterling bloc is considerably larger than their dollar earnings through exports, troop expenditures, and the like, and that the agreements may even result in a smaller amount of dollars available for imports from the U. S.

The council takes the view that with the relaxation of the import and export controls our direct purchases from the area can be greatly increased, and that our dollar expenditures through oil development, air routes and tourist travel can be substantially enlarged so that the long-range results will be favorable to an increased and liberalized trade with the area.

On the 15-man committee making this report were M. W. Bowen, Socony-Vacuum Oil Co., and R. E. Fitz-Gibbon, California Texas Oil Co., Ltd.

# Oil Industry Studying Ruling of Colombian Finance Control Office

BOGOTA.—While only one segment of the oil industry operating in Colombia (Cia. Colombiana de Petroleo El Condor—Shell) is affected by a government resolution there holding that the export of oil is subject to exchange control, much interest, from other quarters, is being evidenced in the possibility that Condor may obtain relief. At present Condor must retain the proceeds, from the sale of Casabe crude in world markets, in Colombia.

The De Mares and Barco grants operate under special contracts. Condor is the first and only grant operating under the provisions of the oil law and started its 30-year commercial exploitation period last June 6, with the first export sale on July 1. When the Control Office ruled that Condor must keep proceeds from Casabe crude sales in Colombia, Condor attacked the legality of the ruling, holding that Article 13 of the oil law exempted the industry from all export levies during the 30-year commercial period granted in the concession contract.

However, the Ministry replied that Article 13 did not grant a complete export freedom to the oil industry, and moreover, that the Control Office ruling that part or all the proceeds from the sale of crude in the world market be retained in the country, does not establish a levy inasmuch as no tax is paid.

In light of the Exchange Control Office ruling that the proceeds from the sale of Casabe crude in the world market are subject to exchange control, Article 14 of the Law 40 of 1945 and Article 20 of the regulatory decrees No. 3164, are of special interest to the oil industry.

Article 20 of the decree interprets the provisions of Article 14 of Law 40. The latter grants the president up to July 19, 1946, authority to reorganize the administrative structure of the Ministry of Finance. This same article authorizes the president to "reorganize the Exchange Control Office and amend or abrogate the measures in force and to adapt them to the requirements which the new economic conditions of the postwar period demand, without affecting the exchange rate, the latter to continue subject to the special provisions in force in this respect."

It is understood that the provisions of Article 20 may be applied to the matter of crude sales in the world market and to adjust the ruling which Condor takes exception to. However, some legal authorities hold that Article 20 regulating Article 14 of Law 40 interprets the latter too broadly. Article 14 does not mention the amendment or abrogation of exchange laws.

During 1945 the oil industry, in Colombia, imported in dollars, cash, $31,000,000 whereas the value of exports may total about $21,000,000. However, this situation obviously can be maintained only during the exploration and development period. Colombia is due to enjoy such a development period, an authoritative source points out, provided the legal situation is adjusted to world-market conditions during the next 5 to 10 years.

## Production Meetings Set for Oklahoma City, Shreveport

The production division of the American Petroleum Institute's Southwest section has scheduled a meeting for May 17-18 in the Washington Youree Hotel, Shreveport. The Mid-Continent section's production division will meet June 6-7 in the Skirvin Hotel, Oklahoma City.

# Labor Troubles Dissolving as All But 21 Refineries Returned

LABOR troubles both within and without the oil industry were dissolving this week as the Navy counted only 21 refineries still in its hands and a break in the steel strike eased a threat to drilling and production operations.

Minor difficulties marred the general optimistic picture but the list of oil properties returning to private management was growing almost daily and Big Steel's contract seemed likely to pave the way to general settlement.

In Houston, however, officials of Reed Roller Bit Co. and Hughes Tool Co. were reported holding to their original position that the national wage pattern could not be granted locally without disastrous results.

Noah Dietrich, executive vice president of Hughes, said any possible additional wage increase at Hughes depended on compensating increase in the company's prices. Hughes, continuing operations despite the strike, added a third shift and announced 3,575 employes working as of February 15. The steel workers union resorted to mass picketing last week at the Reed plant after the company announced it was canceling its union contract and reopening.

Emsco Derrick & Equipment Co. in Dallas continued strikebound and no efforts to negotiate a new contract were reported.

The break in the national steel strike, however, was encouraging news to drillers and supply men. Voluntary bit rationing was begun in Oklahoma last week, and officials of the American Association of Oilwell Drilling Contractors said the list of rotary rigs stacked for new contracts or waiting for rock bits is increasing. Gulf Coast and California operations also were reported slowed by shortages resulting from the strike.

The Government's new policy of tempering wage increases with enabling price boosts led to the agreement by United States Steel Corp. Benjamin F. Fairless, president, pointed out that the Government is authorizing an increase of $5 a ton in ceiling prices for carbon and alloy steel products.

"We are hopeful that under this new policy, due consideration will be given, among other things, to the financial plight of the smaller nonintegrated steel manufactures, fabricators and processors . . .," Fairless said.

"A price increase of $5 a ton will not be adequate to compensate for such past heavy increases in our costs and also to take care of what we estimate will be the total cost to us of this wage increase of 18½ cents an hour to our steel workers. In fairness to our salaried employes in the steel producing subsidiaries increased compensation must also be paid to many of them in view of this wage increase to our hourly steel workers. Higher labor costs in other businesses inevitably will result when a basic industry such as steel makes a substantial increase in its wage scale."

The oil industry, from which 53 refineries and pipe line systems were seized last October, led the way with the wage-raise basis which appears to have become the pattern for settling major industrial disturbances. Oil, however, received no price relief to offset extra wage costs.

Speedy settlement of the remaining refinery disputes is foreseen. Navy-sponsored negotiations were scheduled to begin early this week between oil workers union officials and executives of Magnolia Petroleum Co. at Beaumont and Gulf Oil Corp. at Port Arthur.

### Six Plants Due for Release

Although a tally showed 21 properties still held by the Navy, six of these are due to be released soon by the Navy since settlements have been reached. Included in this group is the plant of Republic Oil Refining Co. at Texas City where a contract was signed late last week. The 18 per cent increase was granted but extra pay for the two night shifts was not included. Shift differentials of 4 and 6 cents have been a feature of many contracts. The new pay scale was made retroactive to December 1, 1945, and covers about 300 workers.

Among the properties recently taken off the Navy-operated list are the Texas Co. refinery at Port Neches, Tex., Socony-Vacuum Oil Co. refinery at Trenton, Mich., and Shell Oil Co. pipe line systems from Wood River, Ill., to Columbus, Ohio, and Chicago. A three-man arbitration board was due to meet this week to attempt to settle a seniority dispute which has been holding up release of The Texas Co. refinery at Lawrenceville, Ill. All properties of Sinclair Refining Co., including pipe lines, have been returned to the company.

One discordant note in the general labor picture came at Corpus Christi where employes of Taylor Refining Co. voted to strike February 27 if the company fails to meet demands for further negotiations. The C.I.O. union listed several grievances, mostly dealing with seniority matters.

In Washington, the National Labor Relations Board announced it has ordered an election within 30 days among employes of Gulf's Port Arthur refinery to determine if they wish to be represented by the C.I.O. oil workers union for exclusive bargaining rights. Another NLRB election also is to be held at the request of the Independent Oil Workers Union of Oklahoma to determine a bargaining agent for employes of Whitehurst Construction Co. which engages almost exclusively in maintenance and construction work for the Continental Oil Co. refinery at Ponca City.

In Houston, the oil industry wage pattern was followed when approximately 675 employes of Sinclair Rubber, Inc., received an 18 per cent increase. The agreement, negotiated between plant management and the C.I.O. oil workers union provides return to a 40-hour week with the wage raise effective as soon as approval is given by Rubber Reserve Co.

## Shell Well Opens New Pool in California

Shell Oil Co., Inc., has apparently found a new oil field ¾ mile east of the Dominguez field in California. The successful well, 1 Dominguez Estate, 2-4s-13w, is pumping at the rate of 250 bbl. daily from a depth of 10,478 ft., with the producing zone topped at 8,660 ft. This well logged several good showings and one of the upper zones was tested, but the sand proved too tight to produce. The producing interval consists of sand and shale, there being no solid sand body present. Failure of the well to show sufficient pressure to flow indicates that the initial pumping rate will probably represent maximum production.

## Instrument Society to Hold Conference September 16-20

PITTSBURGH.—The first national instrumentation conference and exhibit under the sponsorship of the Instrument Society of America will be held September 16-20 in the William Penn Hotel in Pittsburgh with advance arrangements already indicating more than 75 companies will be represented.

Several other societies are planning instrumentation programs in Pittsburgh at the same time. The technical program will be featured by a series of courses directed by Dr. B. R. Teare, electrical engineering professor at Carnegie Institute of Technology. The conference and exhibit was postponed from last year because of war demands on transportation.

# Baker Objects to SPA Report on 100-Octane-Plant Disposal

WASHINGTON.—Serious objections to the report of surplus property administration on disposal of government-owned 100-octane facilities have been filed with Sen. Joseph C. O'Mahoney of Wyoming by Hines H. Baker, chairman of the industry committee on postwar disposal of refineries.

Baker testified before the O'Mahoney committee November 15 and presented a report analyzing the problem and suggesting criteria for a disposal policy. The SPA report was made January 14. Baker declared that on many points SPA differs widely from the industry committee and contains erroneous assumptions, confusing fact analyses, and unwarranted and unsound conclusions.

Most of Baker's objections are to sections of the SPA report which he says would result in setting prices for catalytic crackers so low that present operators could purchase them at an unfair competitive basis with similar facilities constructed by private capital. He challenged SPA's estimate of the amount of excessive wartime construction costs, its statement that private plants have been allowed excessive depreciation write-downs, and that excess cracking capacity makes the plants of little value. He also challenged the SPA conclusion that small refiners have higher operating costs than large and that independents without large capital should have specially favorable terms of sale, and criticized the proposed annual rent of one-twentieth of value as so low as to remove incentive to purchase the plants.

Sale of the refineries on the basis recommended by SPA would not give proper return to the Government and would result in injury to the competitive units in the industry, large and small, Baker declared.

# Rumania's Production Rate Will Depend on Equipment Imports

BUCHAREST. — Drilling activity in Rumania, now considered at its lowest level in 14 years, threatens to fall off still further unless large quantities of equipment and supplies are made available.

Cut off from its normal imports during the war and with its own manufacturing suffering from bomb damage, Rumania is faced with what was described as a resulting decline in drilling for 1946 and a consequent further drop in production.

In a recent memorandum, the Rumanian Petroleum Institute told the Minister of Mines and Petroleum that more than 163,000 tons of equipment, nearly 40,000 tons of which must be imported, are required to carry out a program for drilling a total of 656,000 ft. in 1946.

"Drilling activity in 1945 will be the smallest in the past 14 years, with the exception of 1944 which was considered an abnormal year due to bombing," the memorandum said. "This is due to lack of materials and means of transportation. . . . This lack of materials and vehicles, if prolonged, will bring about greatly reduced drilling activities and production, much lower than that of 1945."

In 1943, drilling in the country was slightly above 1,100,000 ft. with production at 39,150,000 bbl. In 1944, drilling slumped to 481,000 ft., and production to 26,200,000 bbl. Figures for the first 9 months of 1945 show drilling at 382,000 ft. and production at 26,500,000 bbl.

Much of this production is going to Russia. During the year ending September 11, 1945, the U.S.S.R took about 22,500,000 bbl., of which 18,450,000 bbl. was in conformity with the terms of the armistice agreement. The remainder was used by the Red Army on the battle front during the war.

Pointing out the solution of the country's economic problems hinge on continued oil production, the Petroleum Institute's memorandum said 35,500 tons of equipment, 13,500 tons to be imported, are needed to make up for accumulated shortages in 1945, and that 1946 drilling requires 128,000 tons, 36,250 to be imported. Imports must supply most of such equipment as line pipe greater than 7 in. in diameter, rods, tools, and machinery, for drilling, producing and treating crude. The industry needs 447 automotive vehicles, 222 immediately. At least 500 tons of rubber materials must be imported.

The Rumanian oil industry imported between 40,000 and 50,000 tons of equipment annually in prewar years, but much of this was blocked by hostilities. As an example of the critical shortage of equipment, the memorandum said automotive vehicles have fallen to 45.5 per cent of the number on hand in August 1944.

## Two Water-Flood Plans in Oklahoma Approved

Sinclair Prairie Oil & Gas Co. and Harmon & Whitehill have been authorized by the Oklahoma Corporation Commission to install a water-flood on 660 acres in 3-10-27n-15e and in 34-28n-15e, Nowata County. Spacing will be on a 440-ft. interval followed on a five-spot pattern. King Development Corp. has been granted a permit to water-flood 280 acres in 35-26n-14e and 160 acres in 34-26n-14e.

## Texas Uses 129,900,938 Gal. Gasoline During December

AUSTIN.—Texas gasoline users paid $5,237,165 state taxes on a total consumption of 129,900,938 gal. during the month of December. The month's total represented a drop of 1,626,626 gal. from tax-paid sales in November. Government agencies, however, took 48,210,623 gal. in December, compared to 32,583,659 in November.

## Antitrust Suit Answers Set

WASHINGTON.—The Federal District Court here set May 20 as the date for filing answers by defendants in the antitrust suit against American Petroleum Institute and 21 major oil companies.

In reviving the suit, dormant during the war, the Department of Justice asked the court to set a date for answers and the motion was called up February 18. Attorneys for both sides agreed on a further period of 90 days for preparation of answers. In the meantime the defendants are expected to make overtures for settlement of the suit by consent decree, but as yet the Department of Justice has not been approached regarding such negotiations.

## Purchasing Office Opened

NEW YORK.—To facilitate progress of an expanded oil development program, Bolivian Government Oil Fields has opened a purchasing office here to deal with export matters.

The office of the government development corporation is at 270 Broadway. Its opening is a part of the development program which includes intensified drilling in fields at Camiri, Sanandita, and Bermejo, some wildcatting, and plans for refinery and pipe line construction.

# Texas-Los Angeles Line Is Argued Before Commission

WASHINGTON. — Indications that backers of the proposed $40,000,000 Texas-Los Angeles natural-gas pipe line will face opposition came to light here as the Federal Power Commission began its study of the project.

A telegram declaring the carrier is unnecessary since California itself has 14,000,000,000,000 cu. ft. of gas—ample for 25 years—was sent to the commission during its hearing by Rush M. Blodget, executive vice president of the Oil Producers Agency of California.

The commission ruled out the wire when attorneys objected that opponents should formally intervene and submit to crossexamination.

The second objection came from the opposite end of the line—Texas itself—when the San Antonio Manufacurers Association asked that the hearing be delayed pending outcome of the commission's current investigation of the natural-gas industry.

The FPC hearing is due to continue through this week. Later the commission will take additional testimony at Los Angeles.

Three companies are pressing the proposal which already has won approval from the California Railroad Commission. El Paso Natural Gas Co. is asking permission to build a 1,000-mile, 26-in. line from Dumas, Tex., to Blythe, Calif., on the Arizona-California border. Ultimately the line would deliver 305,000,000 cu. ft. daily.

From Blythe, Southern California Gas Co. and Southern Counties Gas Co., both subsidiaries of Pacific Lighting Co., would construct a 214-mile, 26-in. line west to a connection with the Los Angeles system. Ultimate maximum capacity of 305,000,000 cu. ft. daily also is planned for this section.

Testimony at the hearing here dwelt on the contention that huge quantities of gas are being wasted in Texas while at the same time California consumers face a shortage because of declining reserves. The case for the line was presented by Paul Kayser, El Paso Natural Gas Co. president, and Carl Wheat, attorney for the two California companies.

No new gas fields have been discovered in California "for half a decade," they said, and the present supply is largely casinghead gas produced with oil as the crude market requires at the time. The line "is unique in that it is designed to fit into a comprehensive program for the conservation of residue gas produced with oil in the Permian Basin area where at present there is being wasted by venting into the air approximately 125,000,000 cu. ft. per day," Wheat declared.

Initial capacity of the line is estimated at 175,000,000 cu. ft. daily. Kayser said it is planned to sell 125,000,000 cu. ft. of casinghead gas daily during the first year and that later like amounts will be augmented by 50,000,000 cu. ft. of dry gas from the Panhandle and South Hugoton fields through contract between El Paso and Phillips Petroleum Co.

Every week construction is delayed on the project, Wheat said, a billion cubic feet of casinghead gas is wasted which otherwise could be used to meet the California demand.

Whether W. Lee O'Daniel, Texas senator, will actively oppose the proposal was a subject of conjecture. Some time ago he sent a six-page memorandum to FPC deploring export of gas "as depriving Texas and other states with natural-gas reserves of the opportunity to industrialize."

## California Crude Shortage Limits Navy Fuel Output

WASHINGTON.—Shortage of crude oil is the chief factor limiting production of Navy special oil in California, according to reports made to the Petroleum Administration for War in response to a telegram sent leading West Coast refineries last week by Petroleum Administrator Ralph K. Davies.

Davies wire stated that the Navy urgently requires additional supplies of fuel oil on the Pacific Coast and asked the refiners what could be done to increase production, including how much additional production could be expected from increases in price.

Most of the refiners replied that they are now running all available crude and that only negligible quantities of additional Navy fuel oil could be produced unless more crude is obtained. In some instances slight increases were promised, but the total falls short of the Navy's needs. Considerable idle refining capacity was reported, which could be utilized if the crude were available.

A number of California oil men suggested that the Navy reopen production of crude in the Elk Hills petroleum reserve, but so far Navy officials are reluctant to do this. It is understood that the Navy has reduced the steaming speed of vessels being used to return service men and has taken other steps to conserve available supplies of fuel oil, but estimates that it will be still short of fuel during the next 2 or 3 months.

## Coastal Geological Map Brought Down to Date

HOUSTON.—The State-wide Map Co. has completed its geological map of the Texas Gulf Coast, showing all new discoveries as well as all dry holes; and also surface and subsurface data, and all known geophysical prospects.

The map, which was first issued in 1940, has been brought up to date as of February 1, and oil fields are colored in green, while gas and distillate pools are shown in purple, and depleted fields are shown in brown.

The State-wide Map Co. headquarters in Houston, 1005 Isabella.

## Strawn at K.M.A. to Be Repressured With Gas

In the K.M.A. field, Wichita County, Texas, Gulf Oil Corp. has been granted permission to dually complete 2-E Ferguson-Buffalo Oil so as to produce oil and gas through the tubing from the Ellenburger lime (4,216-4,314 ft.) and inject gas through the annular space to the Strawn formation (3,711-3,824 ft.)

Arkansas Fuel Oil Co. will waterflood the 1,500-ft. oil sand underlying its Kemp and Kempner "A" and "B" leases in the K.M.A. field of Wichita County, Texas.

## Monument Planned on Site Of North Texas Discovery

ELECTRA, Tex.—Thirty-five years ago this April, Clayco Oil Co. 1 Woodruff-Putnam on the outskirts of Electra came in as a 350-bbl. producer at 1,630 ft.

This event which opened up North Texas is such an important date in Texas oil history that the Electra is negotiating for a monument and plaque to dedicate the thirty-fifth anniversary of the discovery April 1.

Clayco sold out to Corsicana Petroleum Co. which later became Magnolia Petroleum Co. Electra is working on plans for the monument with Magnolia which owns the site. No. 1 Woodruff-Putnam produced about 25 years before it finally was abandoned.

## Wyoming Quotation Posted

A price of 65 cents per barrel has been posted by Standard Oil Co. (Indiana) crude oil purchasing department for Wyoming black crude from two Wyoming fields, Maverick Springs and Circle Ridge, both in Fremont County. Prices were quoted on the basis of use of 100 per cent tank tables.

# INTERNATIONAL

## British, Dutch, Mexico May Settle Oil Claims

NEW YORK.—Methods of compensating British and Dutch interests for oil properties expropriated by Mexico in 1938 have been reached, according to a report here late last week from Mexico City in which the British Foreign Office said agreements were signed there by the Mexican, Dutch and British governments.

In keeping with the understanding, the British Government which is also acting for the Netherlands in this matter, and Mexico are each slated to name an appraiser by March 7. The two appraisers will determine independently the amount and nature of the rights and interests of the Dutch and British holdings in Mexico on the basis of the value of these holdings in 1938.

If the two experts agree on their appraisals, negotiations will commence to determine the amount Mexico should pay. However, if they disagree, the governments reportedly will solve their differences by direct negotiation. The experts' report is scheduled to be made by February 7, 1947.

As the Mexican Government, reportedly, has several counter-claims, the two government experts will appoint one additional expert each to examine and determine the nature, legality and amount that the foreign interests must pay Mexico.

## Venezuela's Oil Bureau Under New Director

Doctor José Martorano was appointed director of Venezuela's Petroleum Bureau (Oficina Técnica de Hidrocarburos) last month. Dr. Luis Herrera F., former director, resigned his position. Dr. Herrera plans to leave for the United States where he will spend approximately 3 months.

In 1928 Dr. Martorano graduated with the degree in civil engineering from the Central University in Caracas. Until August 1930, he worked as surveyor in various agricultural regions of the country. In August 1930 he was named field inspector in the State of Falcon, District of Buchivacoa. He held this position until June 1931 when he was promoted to the position of technical petroleum inspector with jurisdiction in the states of Monagas, Anzoategui, Sucre and the Federal Territory Delta Amacuro. In 1939 he came to the United States to study. In June 1941 he graduated from the University of Tulsa with a bachelor of science degree in petroleum engineering.

In 1942 he returned to Venezuela and began work in the Ministerio de Fomento, Department of Hydrocarbons, on the estimation of petroleum reserves in Venezuela.

*DR. JOSE MARTORANO*

The present Venezuelan Petroleum Bureau was created as a division of the Ministerio de Fomento by a presidential decree on March 31, 1943. The office was divided into four technical departments: mapping and concessions; economics; exploration, refining and transportation; and production auditing. Dr. Martorano was appointed head of the department of exploration, refining and transportation, and remained in this position until recently when he was appointed to succeed Dr. Herrera.

## Stalin Sets Russian Oil Goal of 60,000,000 Tons

LONDON.—Premier Stalin has called on his people for huge production increases, including a goal of 60,000,000 tons of oil (435,000,000 bbl.) although reports here indicate Russian crude output is ranging some 5,000,000 tons (36,250,000 bbl.) under prewar requirements.

Figures vary on Russian oil production. The Statesman's Yearbook of 1945 places Soviet oil output in 1941 at 38,000,000 tons (275,500,000 bbl.) Reports gathered here by the Petroleum Press Service tell of a present oil shortage which has an important bearing on the nation's foreign policy.

Russian oil production in 1945 was placed at 25,000,000 tons (181,250,000 bbl.) compared to a prewar requirement of 30,000,000 tons (217,000,000 bbl.) Needs of reconstruction, occupation armies and newly incorporated states adds to the shortage.

In addition to the Maikop fields in the northern Caucasus, which temporarily fell into German hands, fields at Grozny also were damaged. Altogether, 3,000 wells with a normal production of 5,000,000 tons (36,250,000 bbl.) were lost. Germans damaged refineries at Grozny, Odessa, Kherson, and Krasnodar, demolishing sections of the Grozny Trudoyvaya pipe line and more than 700 storage installations.

## Synthetic Gasoline and Rubber Banned in Germany

BERLIN.—A manufacturing ban on synthetic gasoline and rubber has been decreed by the four-power Allied Control Council in Germany in a move to convert this country from a heavy industrial nation into an agricultural and light industrial economy.

Other key industries banned in Germany include ammonia, primary aluminum and magnesium, ball and taper bearings, certain war chemicals and heavy farm tractors and machinery tools. Under the Potsdam agreement the manufacture of airplanes and ocean vessels, in the former Reich, is also prohibited.

## Colon's Venezuelan Oil Production Up Slightly

NEW YORK.—Total production in Venezuela for the 4 weeks ending December 31, 1945, of the Colon Development Co., Ltd. (Shell) was 17,173 bbl. daily, compared with 16,834 bbl. per day for the 5-week period ending December 3, 1945, according to a late report from the Asiatic Petroleum Co. Production for the 4-week period ending October 29, 1945, was 15,653 bbl.

Colon's total production for 1945 was 5,788,422 bbl., compared with 7,077,050 bbl. for 1944.

## Bolivian Production Rises To 39,411 Bbl. in August

WASHINGTON. — Bolivian crude production climbed to a total of 39,411 bbl. in August, a 7 per cent increase over the preceding month, according to figures of the Bureau of Foreign and Domestic Commerce.

Daily average output was 1,271 bbl. Production of refined products amounted to 22,478 bbl. Imports of gasoline totaled 503,400 gal. during the month.

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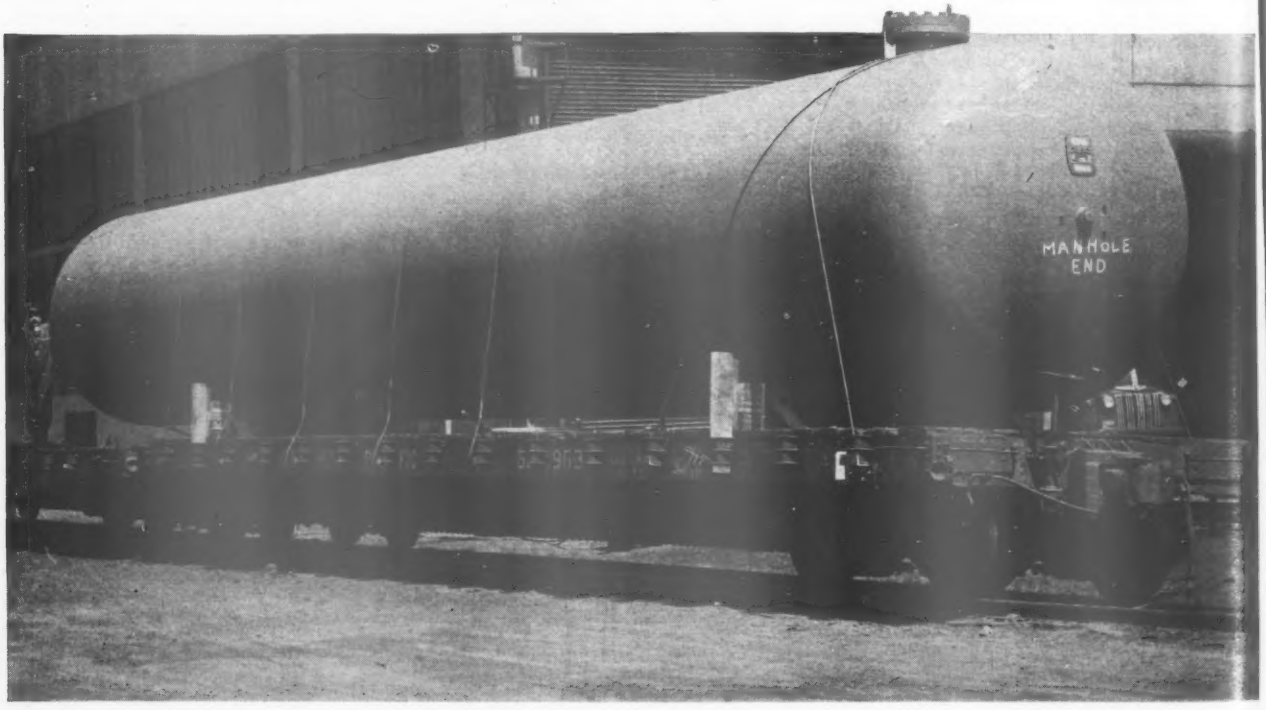
The units shown on these two pages are indicative of the scope of our experience in this line of work. The three vessels in the large view on the opposite page are pressure stills. They were installed in Texas as a part of an oil company's high pressure absorption unit. The high pressure still is 49 ft. high by 11 ft. in diam. and has twelve trays. Its operating pressure is 185—200 lbs. per sq. in. The intermediate pressure still, which operates at 50-60 lbs. per sq. in. and is 12 ft. in diam. by 66 ft. high, has eighteen trays. The low pressure still is 61 ft. high by 8 ft. in diam. and has twenty-four trays. Its working pressure is atmospheric to 5 lbs. per sq. in.

The pressure vessel shown below is a propane storage tank. It s 106 inches in diam., 67 ft. in length and has a water capacity of 30,000 gals. This vessel has ellipsoidal heads.

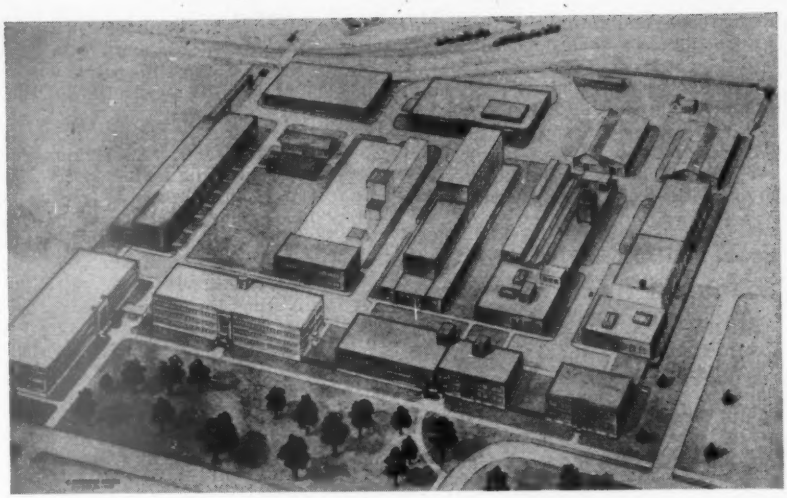
If you are planning the installation of welded steel pressure vessels of any type, write our nearest office for quotations.




# CHICAGO BRIDGE

Chicago, 4 . . . . . 2128 McCormick Building
New York, 6 . . . . . 3347-165 Broadway Building
Cleveland, 15 . . . . . 2204 Guildhall Building
Los Angeles, 14 . . . . . 1423 Wm. Fox Building
Atlanta, 3 . . . . . 2154 Healy Building
Birmingham, 1 . . . . . 1536 North 50th Street

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PENNA.



*Artist's sketch of Socony-Vacuum Oil Co., Inc., new laboratories showing physics and chemistry buildings and administration and analytical buildings in the foreground*

# Industry's Research Facilities Undergoing Substantial Expansion

ANNOUNCEMENT by four major companies of laboratory construction plans and a strengthening of research activities underscores the oil industry's own postwar study of petroleum's widening application in new fields and new products.

Several thousand scientists, technicians and other workers will be provided with new quarters and facilities to carry out their projects in laboratory projects announced by Standard Oil Co. (Indiana), Socony-Vacuum Oil Co., Inc., and Sinclair Oil Corp.

Expanding research activities have resulted in the consolidation of the two engineering departments of Standard Oil Development Co., central technical organization of Standard Oil Co. (N. J.). The move brings into one organization more than 400 scientists and other employes of the general engineering and process engineering departments.

Two of the new laboratory research projects are in the Chicago area. Work has begun on the new petroleum research laboratories of Indiana Standard which will cover two city blocks adjacent to the company's Whiting refinery.

Scheduled for completion early in 1947, the laboratories entire program includes an administration and chemical engineering building, main research laboratories, pilot-plant buildings equipped for work on greases, catalysts, and chemicals, a separate building for research on distillation, new engineering laboratories, and a greenhouse for special work on plant sprays.

The second laboratory in the Chicago area is that planned by Sinclair at Harvey, Ill. On completion, Sinclair's research and development departments and other facilities now located at the East Chicago refinery will be moved to Harvey.

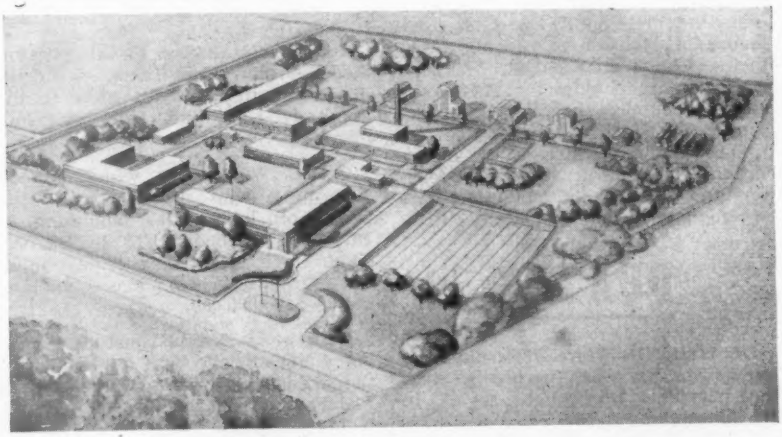
Completion of the new facilities will double the size of Sinclair laboratories, and the technical and professional staff will number more than 550 persons. Pointing out emphasis placed on research during the war, E. W. Isom, Sinclair vice president in charge of research and development, said the company is "interested in developing further the uses of petroleum, for example—in the fields of plastics, rubber, medicine, household conveniences, and specialized industrial products."

At Paulsboro, N. J., Socony-Vacuum will erect a number of new buildings to promote an expanded research program in its research and development laboratories. The project, announced earlier, embraces chemistry and physics buildings, a pilot plant for lubricating oils, and other structures.

Of interest in Socony-Vacuum's announcement was the statement that the physics laboratory will conduct exploratory work in the use of nuclear energy and electronic devices to determine the extent to which they will be useful in the industry. The new construction will permit greater research activity in gas turbines, airplane, automobile, diesel, and marine engines, while the lubricating oil plant will serve as a guide for later full-size installations, according to Wilbur F. Burt, vice president in manufacturing.

Standard Oil Development Co. has given the name of Esso Engineering Department to its new consolidated organization. It will be directed by E. W. Luster, chief engineer, working under Dr. N. E. Loomis, vice president in charge of engineering. The regrouping is expected to place greater attention on mechanical engineering and engineering research and improve work supervision with increased efficiency. The department's activities will be enlarged to cover not only refining but certain phases of producing, pipe line, shipping, and marketing activities.

Under the new setup, E. H. Barlow, former chief engineer, becomes consulting engineer of the company. Assistants to Luster are P. J. Byrne of the process engineering department; C. E. Paules of the general engineering department, and N. F. Myers, former associate manager of the process division.



*Sinclair Oil Corp.'s proposed research and development laboratories at Harvey, Ill., are shown in this artist's sketch*

# Industry Seeks Exclusion From Price Control

WASHINGTON. — Hearings on extension of the price stabilization act for another year beyond its present expiration date of June 30, 1946, opened this week before the House committee on banking and currency, and representatives of oil producers were scheduled to appear some time during the first week in March.

The Independent Petroleum Association of America expected to take the lead in requesting an amendment to the law to remove price ceilings from commodities, particularly petroleum, which are currently being produced in volume sufficient to meet demands, and to make the argument that the Office of Price Administration may now withdraw from this field and permit prices to fluctuate in a normal fashion.

This argument was strengthened by a phrase in the executive order issued last week by President Truman outlining the new wage-price policy. This declared that it is the policy of the government that there be prompt and firm enforcement of government controls over scarce materials and facilities. The inference may be drawn that controls may be relaxed over commodities no longer scarce, though OPA officials doubtless will oppose congressional action to terminate their powers over prices of any specific commodities.

## Jap Synthetic-Oil Plants May Be Dismantled

NEW YORK. — Indications that a manufacturing ban on synthetic gasoline may be imposed in Japan, as was done in Germany recently, were seen here this week with the report from Tokyo that allied headquarters may soon dismantle Nippon's petroleum refining equipment.

Prior to the war there were 17 refineries in Japan proper and 1 in Manchuria with a total daily refining capacity of 55,600 bbl. Daily prewar production was about 12,300 bbl., with 6,000 of this coming from Japanese controlled half of the island of Sakhalin, which, according to the recently disclosed Yalta agreement, has been ceded to Russia.

Estimated output of Japan's synthetic petroleum refineries has been put at about 245,000 bbl. annually, while the supreme command's estimate of that country's normal needs is in the neighborhood of 23,800,000 bbl. annually.

Feeling within Japan, by members of Nippon's Ministry of Commerce and Industry, is that the synthetic-oil plants should be converted to the manufacture of fertilizer, but the allied command reportedly does not favor reconversion that might, at some future date, go back to furnishing a so-called war potential.

During the war, Japanese oil fields produced about 60,000,000 bbl. of crude, which some sources here believe is "a bit too high." Since about 1930 Japan has not produced more than 10 per cent of her needs.

## Preservation of Records Sought by Texas Group

MIDLAND. — The Texas Railroad Commission's oil and gas division with its voluminous engineering and statistical records, now quartered in a onetime funeral home, will be moved to a newly purchased state office building in Austin if a campaign now being pushed by a group of Texas oil men is successful.

Spearheading the proposal is V. E. Cottingham, Midland, former director of production of the division and now an oil-field engineering service operator in Midland. Cottingham called on oil operators and company representatives to meet in Austin this week to discuss the matter following the state-wide proration hearing.

## Pipe Line Company Buys Bonds for $6,449,000

NEW YORK.—Natural Gas Pipeline Co. of America has bought $6,449,000 of its bonds and $426,000 of debentures for cash and at face value from the People's Gas Light & Coke Co.

George A. Ranney, Peoples Gas Light & Coke chairman, announced in Chicago that the company also invested $3,621,548 in Natural Gas Pipeline stock, out of a total capital contribution of $17,000,000 to the latter. Natural Gas, he said, sold a new $25,000,000 first mortgage bond issue to insurance interests and with the proceeds from this sale, plus the $17,000,000 capital contribution paid off all of its previously outstanding indebtedness.

In Philadelphia, Texas Gulf Producing Co., Houston, and Bradley Producing Co., Wellsville, N. Y., were named as high bidder for 14,000 outstanding common shares of Ohio Fuel Supply Co. which will be sold by Columbia Gas & Electric Corp. in accordance with an order of the Securities and Exchange Commission. The two companies will pay $2,651,110.

# DEATHS

**Dr. Walter P. White,** 78, a physicist known for his work in precise heat measurements, died February 7 in Washington, D. C.

**Owen M. Flannery,** 68, who retired 5 years ago after 25 years service as an engineer with Standard Oil Co. of New Jersey, died February 9 in Elizabeth, N. J. Most of his work was at the company's Bayway refinery, Linden, N. J.

**George D. Foster,** 58, director and secretary of Devonian Oil Co., died February 13 in El Paso. A native of Missouri, Foster in 1908 became a stenographer for Devonian and advanced until he became head of the land department. He was active in oil boom areas throughout Mid-Continent and Gulf Coast beginning with Wichita Falls in 1911. He was a director of the Independent Petroleum Association of America.

**B. E. Sibley,** 59, chief technologist for Continental Oil Co. since 1929, died February 13 in Needles, Calif. Sibley, who joined Continental as a salesman in Colorado in 1912 and spent 17 years in direct sales work before his appointment as chief technologist, had resided in Ponca City, Okla., since 1930. He was active in several professional organizations and during the war made significant contributions to development of fuels and lubricants for the war department.

**Searle Dougherty,** 47, vice president of Standard Oil Co. of Brazil, a subsidiary of Standard Oil Co. (N. J.) died February 13 in Rio de Janeiro.

**Irving Katz,** 50, Wichita oil supply dealer, was found dead February 12 in an automobile near Newton, Kans.

**Elmer C. Garthwait,** oil producer of Bolivar, N. Y., died February 4 in Olean, N. Y.

**Arthur J. Crist,** 55, independent oil operator, died February 14 in Tulsa.

**Owen F. Luckenbach,** retired assistant to the general manager of National Transit Pump & Machine Co., died February 3 in Bethlehem, Pa.

**O. D. Towery,** 42, engineer for Ford, Bacon & Davis Co. at Texas City, Tex., was killed in an automobile accident near Galveston February 13.

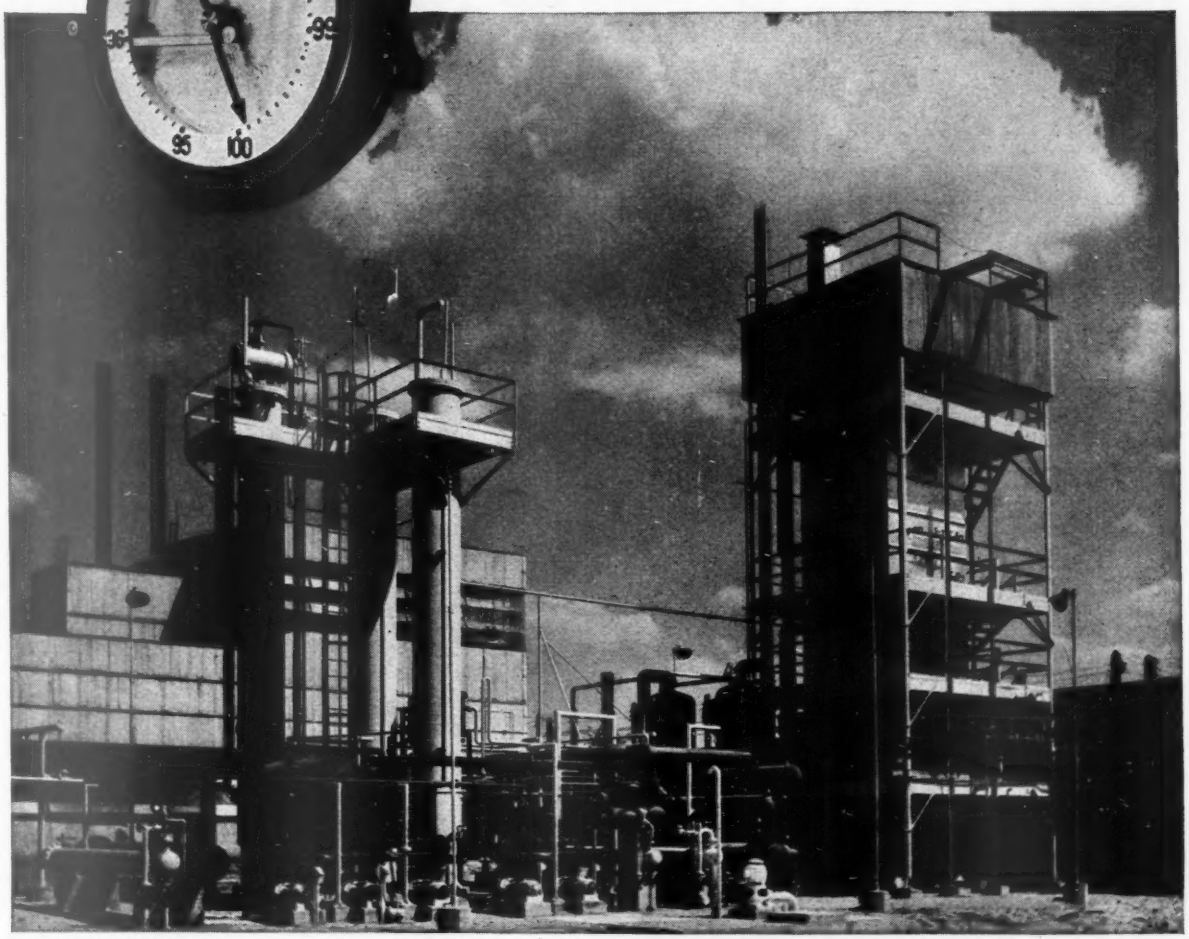
**John H. Tomlinson,** 54, oil operator, died February 17 in Tulsa. As a drilling contractor, he was active in the Seminole area and other developments.

**Col. E. Walters,** 79, widely known auctioneer who presided over the Osage oil lease sales beginning in 1912, died February 15 in Skedee, Okla. He is credited with auctioning Osage Indian territory leases amounting to $300,000,000.

**William F. Braun,** consulting mining engineer who was a member of the wildcat crew that drilled near Red Fork, Okla., in 1896, died recently in California.

**Bruce Rush,** 97, retired oil producer, died February 18 in Tulsa.

## High-purity Hydrogen at Low Cost?



A ROBERT YARNALL RICHIE PHOTO

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# Efficient Deep Development Program Is Demonstrated in Russell Field, West Texas

*by E. H. Short, Jr.*

**Drilling of the deeper productive formations is in progress throughout the Permian basin. This is a case history report, in short form, of a current Clear Fork development program: the pool, the drilling, the completion, the production equipment**

APPLIED efficiency in drilling and operating practices appears to be largely responsible for the comparatively trouble-free operation and development of the Russell field in the north central part of Gaines County, Texas. This field is approximately 16 miles southeast of Denver City.

In this field there are two major operators, Shell Oil Co., Inc., and Magnolia Petroleum Co. The Russell pool is on a northeast southwest domal anticline, and from the present field data, this structure has an extremely sharp south and east dip into the basin east of the central basin platform. There are two known producing zones in this field. One is the upper Clear Fork zone at 6,100 ft. and the other, the lower Clear Fork zone, topped at 7,500 ft. The first, or the upper zone, is equivalent to the Robertson field southwest of the Seminole, Texas, field. The lower Clear Fork is equivalent to the Fullerton pay of Andrews County. The nearest production is in the Wasson field.

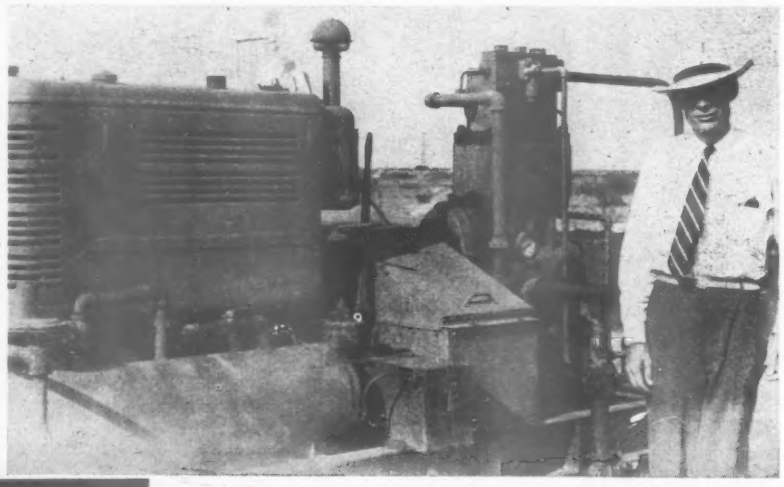


*Fig. 2—One of the individual high-pressure hydraulic pumping plants. By the pump is R. F. Madera, district engineer, Shell Oil Co., Inc.*

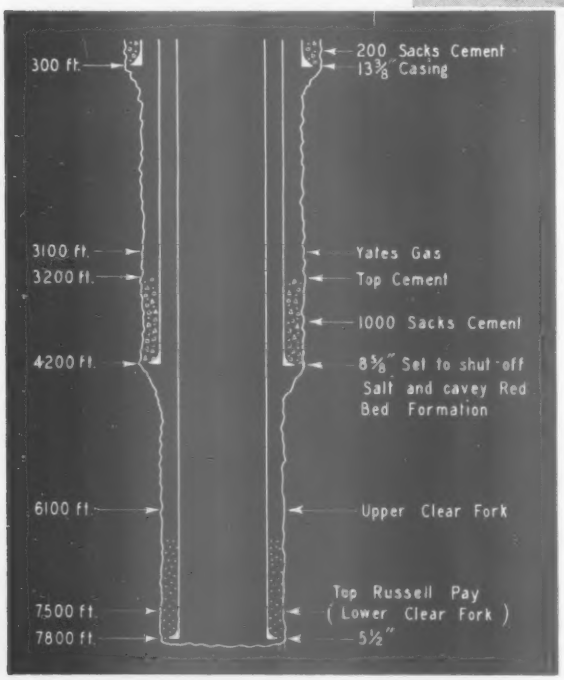



*Fig. 1—(Below) Typical casing program and formations in Russell pool, West Texas*

The discovery well, 1 Leaberton, Section 458, was drilled by the Shell company in December 1942. The typical depth of wells in this field runs around 7,800 ft. Sweet oil is produced from a 300 ft. section of dolomite pay. Currently there are about 12 producing wells in the field, and from present indications it appears that the field will ultimately have approximately 50 producing wells.

While the drilling problems in this field are not inherently difficult, the careful attention given all drilling details by the field organizations has so far eliminated the type of trouble which usually arises from so-called unforeseen hazards.

Drilling is begun with 5 tons of Aquagel and the mud weight runs about 10½ lb. per gallon. The 13-in. is set while using this weight mud. When the 8⅝-in. is set the viscosity has been brought up to about 38 seconds A.P.I.

Below the 8⅝-in. clear water is used until a depth of approximately 5,900 ft. is reached and at this point the addition of Aquagel is begun in order to get good cutting and to prevent watering the 6,100-ft. pay. As drilling progresses, the viscosity is again brought up to 38 seconds A.P.I. which lowers the water loss to about 20 cc. In the event an unexpected pay zone is encountered, the hole is in good condition for making the necessary drill-stem tests.

The casing program in the Russell

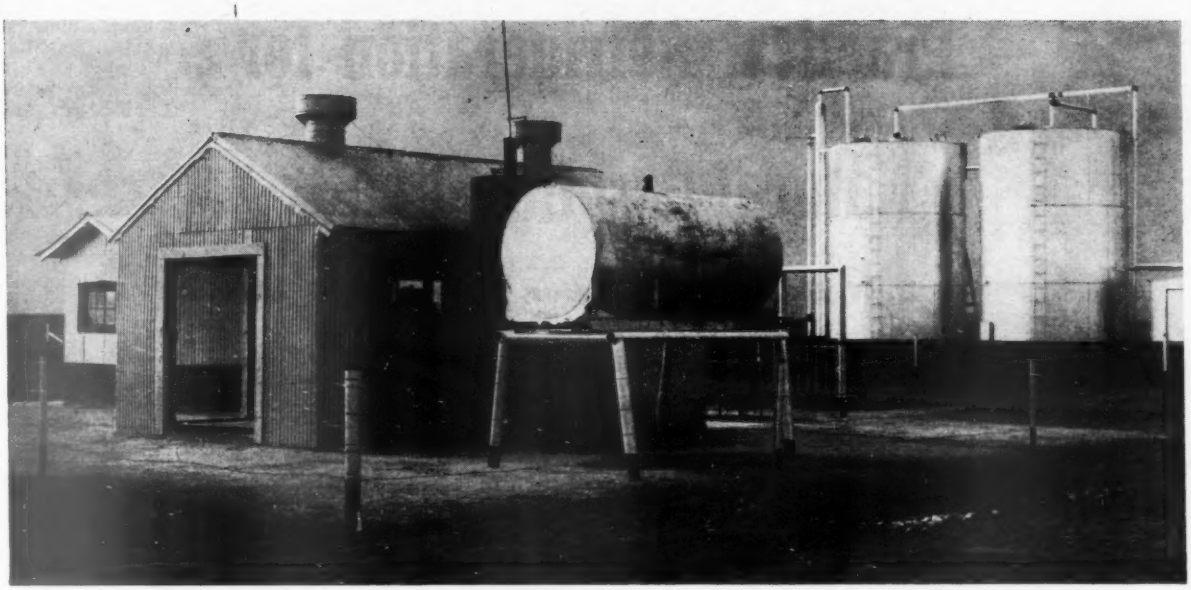


*Fig. 3—Power oil is supplied to three wells from this central high-pressure pump installation in the Russell pool*

field is shown in Fig. 1. In this field the Yates sand is encountered at approximately 3,100 ft. This sand contains sweet gas and is not cemented off when 8⅝-in. is set. The gas is bled off through the bradenhead while drilling. This string of casing is set to case off the salt section; also the red bed section, which has a tendency to cave.

When full penetration of about 300 ft. has been taken, wells are selectively acidized, either by the electrical-pilot method or by means of packer settings. It should be mentioned at this point that wells in this field encounter a barren porosity at a depth of approximately 5,000 ft.

The typical acid shot amounts to 13,000 gal. of 20 per cent acid solution, and this is injected in four separate stages. After acidizing, the wells are brought on to flowing production by swabbing.

### Production Practice

After acid, wells flow a typical potential of about 350 bbl. through 2-in. tubing. Bottom-hole pressures are in the neighborhood of 2,100 psi. The flowing life of these wells averages about 6 months.

Most of the wells in this field are producing by means of hydraulic pumping systems. The subsurface equipment consists of a hydraulically operated pump, 2½-in. tubing, and inside the tubing is a string of 1-in. which conducts high-pressure power oil from the surface for the hydraulic operations of the reciprocating subsurface pump. Some of the wells in this field are operated by individual surface pumps as shown in Fig. 2, and others from a central pump station, Fig. 3. In the latter case the central pump station furnishes power oil at a pressure of approximately 1,700 psi. for three wells.

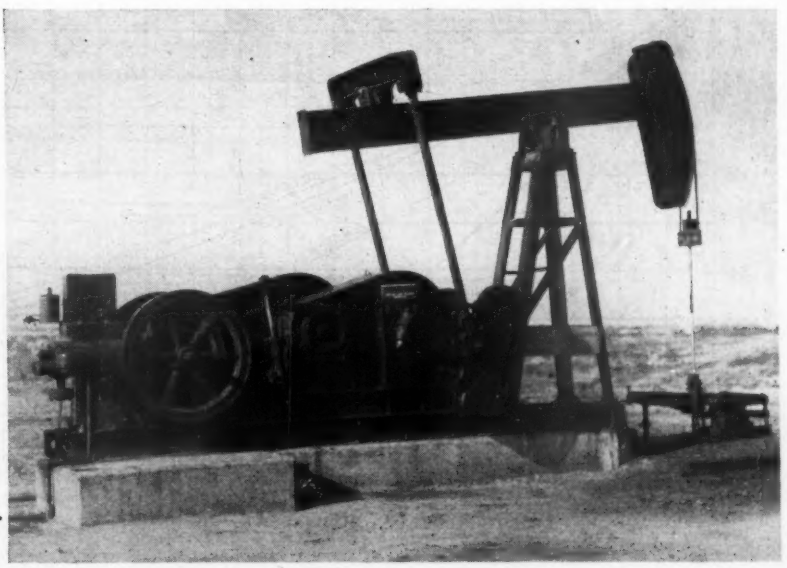
Three of the wells in this field are on the bean with pumps set at 6,500 ft. These wells are operated by small pumping units powered by 15-hp. engines. Subsurface equipment consists of 2-in. tubing and tapered sucker-rod strings consisting of ¾-in and ⅞-in. rods. The inside diameter of pumps used is 1½-in.

While the conventional pumps are set at 6,500 ft. the fluid-level surveys show high operating fluid levels which account for the use of relatively light sucker-rod string and surface pumping unit.

The hydraulic pumps are set at 7,800 ft. and indications are that these pumps are lifting fluid from practically the bottom of the hole.

A closed hydraulic pumping system is used in this area and no trouble has been experienced with corrosion. The hydraulically equipped wells pump less than 100 bbl. per day and full-day operation is not necessary to obtain the production. The only trouble experienced in the operation of these pumps has been from extremely small pieces of hard lime entering the pump; however, this trouble has not been of a serious nature.

*Fig. 4—Due to high operating fluid level some wells in the Russell pool are handled with small 15-hp. pumping units*



# Practical Refrigeration for Natural-Gasoline Plants

*by R. W. Heath, J. B. Taylor, Jr., and P. W. Hill*

CONSIDERATION will be limited to the use of propane as a refrigerant and to the application in low-pressure absorption plants with absorber pressures of less than 100 psi. Propane has the advantage of being inexpensive, readily available, and of high refrigerating efficiency. Operating pressures are above a vacuum which precludes air contamination and all pressures allow reasonable pipe-line sizes without serious pressure drops.

The advantages of refrigeration are not alone due to the reduction in vapor pressures but also the fact that the heavier fractions are reduced to a relatively greater extent than are the lighter hydrocarbons below the butanes. As a result there is a greater spread of vapor pressures between the various hydrocarbons at the lower temperatures. This results in better separation of the fixed gases from the fat-oil tank and wherever colder temperatures are developed. An example of this condition is illustrated in Fig. 1 showing oil temperatures against increased absorption below 80° F. in terms of increased oil rate to secure equivalent results. From this curve it can be found, for example, that by lowering the oil temperature from 80° to 55° F. this is equivalent to a 50 per cent increase in oil rate at 80° F. in so far as the butanes are concerned but only 35 per cent for propane, 24 per cent for ethane, and 17 per cent for methane. This advantage of selective absorption is not available by the other means of increasing plant capacity such as increased oil rate, lighter mol weight oil, or increased pressures.

**The authors believe refrigeration can be justified in a new low-pressure absorption plant in cases where the future maximum volumes of wet gas are known within reasonably close limits, or where the atmospheric temperatures and humidity are too high to allow efficient atmospheric cooling. They believe also that refrigeration is the simplest and most economical means of securing additional plant capacity in existing plants. The authors are associated with Signal Oil & Gas Co., and the article was presented as a paper before a meeting of the California Natural Gasoline Association last month.**

The costs of installing a refrigeration unit capable of subcooling the lean absorption oil by 25° F. are small in terms of equivalent oil rate and it would appear that such a unit might easily be justified in a new plant. This would be especially true where the volume of gas to be treated may be expected to remain relatively constant and the prospects of future additions to the plant to be unlikely. It is also true where poor conditions of atmospheric cooling are obtained which would require an oil circulation that could not be justified when compared with the corresponding costs of using a lower oil circulation and installing propane refrigeration to secure the same results. Where future expansion seems likely, it would appear reasonable to design the plant with the thought that refrigeration might be added later.

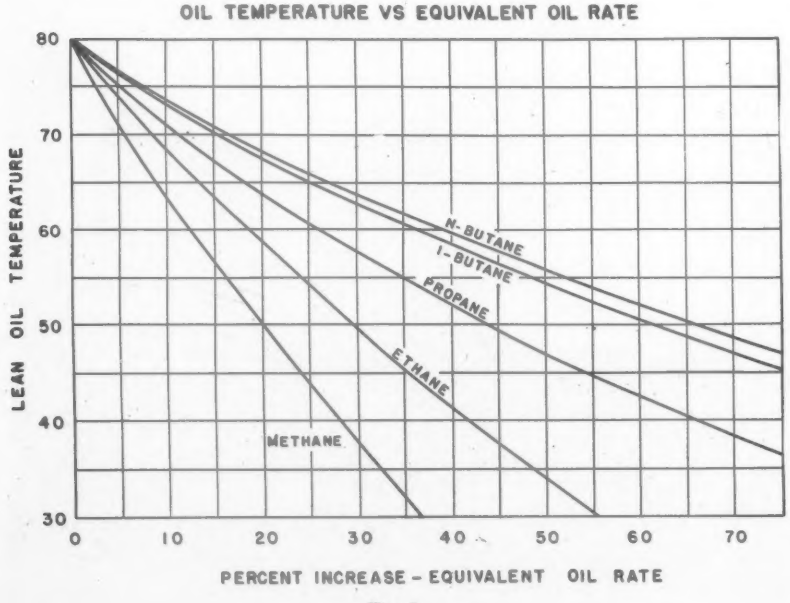



*Fig. 1*

### Benefits of Refrigeration

Benefits of refrigeration are more easily appreciated in existing plants where it is necessary to increase the plant capacity for the purpose of extracting additional light hydrocarbons or to regain a plant efficiency that has been reduced due to additional load. Under these conditions the costs of installing the additional equipment for the necessary oil circulation (and additional plant units) can usually be shown to be much greater than the corresponding cost of installing a refrigeration unit to accomplish the same results. In addition the actual installation of a refrigeration unit is a simple problem and can be accomplished without the usual interference with the existing plant units. Our studies indicate that the additional refrigeration to increase the plant capacity by 50 per cent could be installed in our plants for about one-half the cost that would have been required by a relative increase in oil rate.

In addition to the savings in first costs for a refrigeration system cooling the lean absorption oil, there is also a very definite savings in operating costs. The fuel requirements of a refrigeration system are practically limited to the engine fuel which is nominal, while the fuel required to both heat and pump increased quantities of absorption oil would amount to considerably more. Also the other operating and maintenance costs are low in comparison with the costs for

the additional boilers, stills, pumps, exchangers, and their auxiliaries.

Refrigeration units can be designed to maintain minimum oil temperatures where the plant is overloaded and can utilize the lowest temperatures that can be secured in cold weather. Where the temperatures that can be secured under this arrangement are lower than necessary or where freezing or hydrate formation occurs, a back-pressure valve, or temperature-operated motor valve can be installed in the vapor line from the chillers. In cases where constant plant-operating conditions are desired, a temperature controller on the oil will be useful. This may be especially true where the existing absorption plant is overloaded at some one point such as the stabilizer. In such a case a controlled oil temperature may help maintain uniform vapor volumes and quality of products that would smooth out these plant operations.

In fact the refrigeration unit complements the absorption unit unusually well since it supplies the maximum cooling when the atmospheric cooling is the poorest. When the atmospheric cooling is less efficient and the temperature of the lean absorption oil to the refrigeration system is relatively high there is an increased temperature difference between the oil and the propane that results in increased cooling. This additional cooling in turn increases the volume of vapors to be handled by the compressor and therefore raises the propane pressure and temperature but not sufficiently to entirely offset the increased cooling. The fact that the compressors are more efficient with a higher intake pressure is advantageous to increased refrigeration. A compressor with clearance pockets has a still higher ratio of efficiency at higher intake pressure. The resulting lowered compression ratio allows its greatest advantage and maximum refrigeration at those times when the absorption plant, with its atmospheric cooling, is the least efficient.

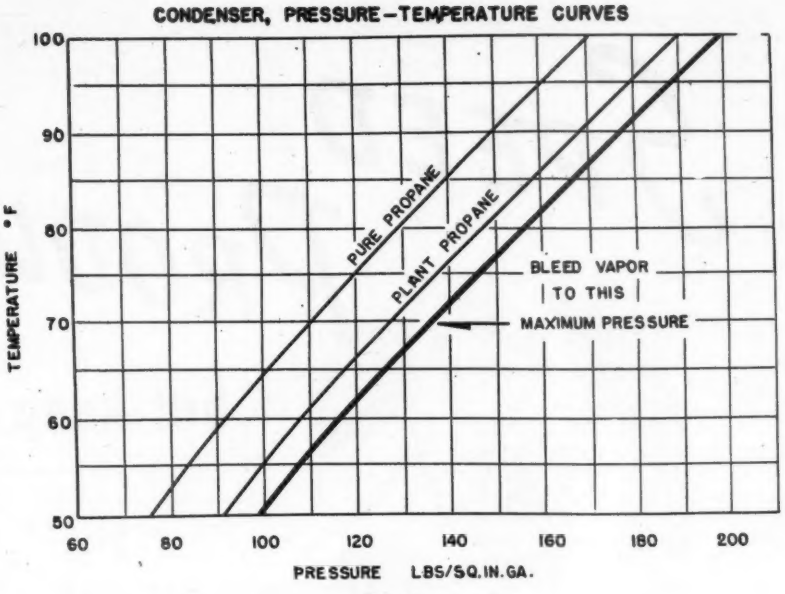



*Fig. 2*

The refrigeration unit supplements the absorption plant in still other ways that are important although not as generally appreciated. First, the fat oil entering the plant exchangers on its way to the preheater is proportionally lower in temperature as a result of refrigeration. This increases the mean temperature difference within the plant oil to oil exchangers and lowers the lean-oil temperatures to the plant coils. As a result these coils are required to extract less heat

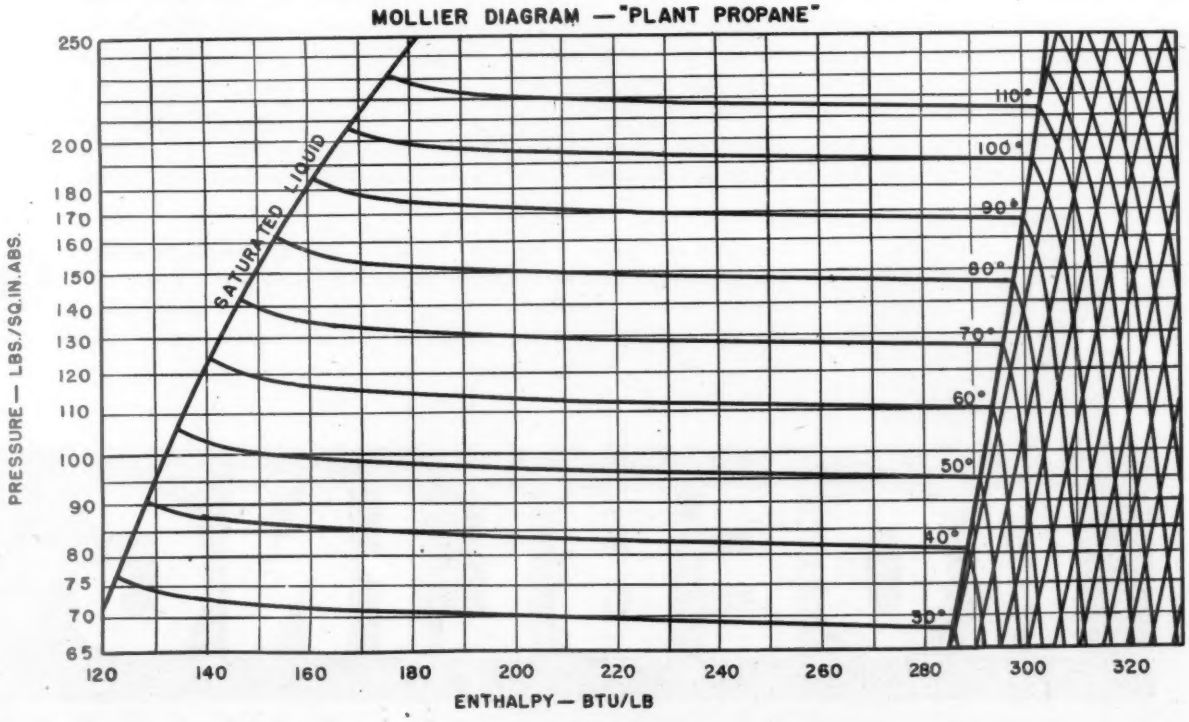



*Fig. 3*

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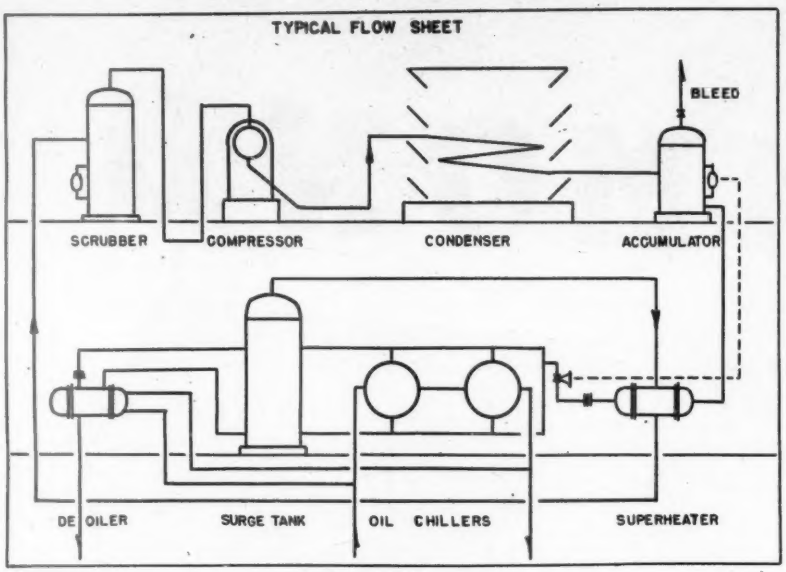


*Fig. 4*

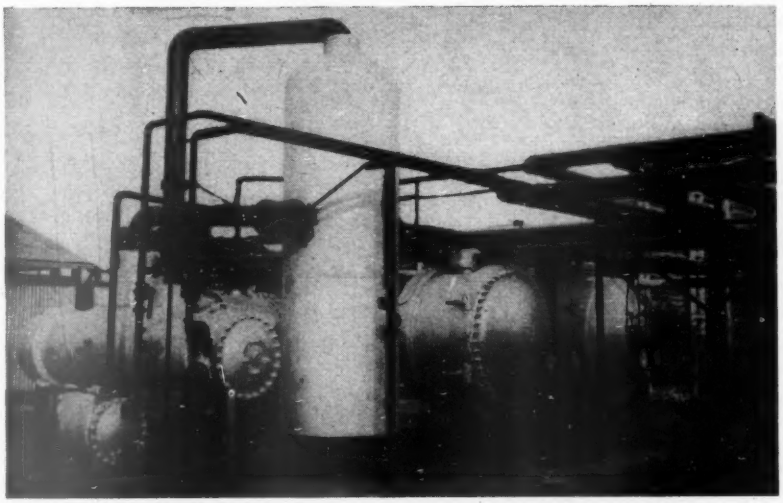

*Fig. 5—Signal Hill refrigeration unit. The units are, left to right, deoiler, raw-gasoline chiller, propane surge tank, and oil chillers*

and a closer approach of the lean oil to the water temperature is realized. This reduced lean-oil temperature may be very appreciable in plants that are overloaded as is often the case when new refrigeration units are to be installed. On the other hand we have found relatively small increases in the heat load of the oil preheaters to the still.

Also the residual dry gas content, that is due to the vapor pressure of the light fractions in the lean oil, is reduced.[3] With the lowered oil temperature and corresponding drop in vapor pressure, there is a smaller loss of gasoline in the dry gas. This same factor would allow the use of a lighter mol weight absorption oil and resulting increased absorption efficiency since complete stripping in the plant is not as essential.

Still another advantage of refrigeration results from the lowered dew point of the dry and the reduced water-vapor content. As a result there is usually no condensation in the dry-gas fuel lines and this allows better performance through decreased pressure drops and reduced corrosion problems.

Another benefit lies in the fact that propane liquid can easily be made available for other services. These may vary from laboratory refrigeration, to air conditioning to overhead condensation in a stabilizing column, or to wet-gas cooling. Wet-gas cooling is not too important in a low-pressure plant since higher exchange rates can be secured on the oil side and it is generally economic to take the full subcooling at this point. However, for maximum refrigeration wet-gas cooling is definitely economic.

### Process Design of Plant

The process design of a refrigeration plant is fundamentally very simple. By the use of some practical data the operating conditions in a propane refrigeration plant can be found to a degree of accuracy well within the range of the basic assumptions of future operating conditions in the plant. We also believe that any natural-gasoline plant can secure a satisfactory propane refrigerant from their plant.

When appreciable amounts of ethane and lighter contaminants are in the feed to the refrigeration system it is advisable to vent sufficient vapor from the condenser accumulator to bring the refrigerant down to a point of reasonable purity. This venting, or bleeding, is suggested in order to reduce the working pressures as well as the compressor horse pow-

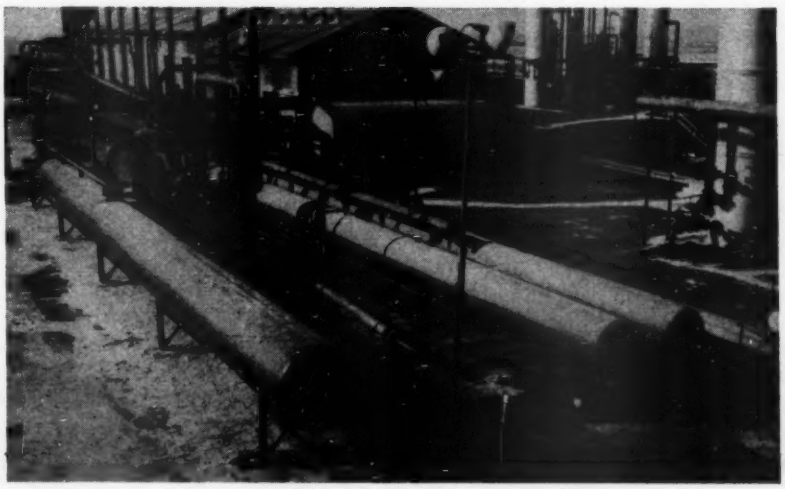

*Fig. 6—Huntington Beach oil chillers. The 39-in. by 65-ft. unit at left is the final oil chiller in series with the two 25-in. by 65-ft. chillers on the right. The deoiler, superheater, and scrubber are shown between the two chiller units*

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Leaf springs, in combination with the rotating movement created by the weight of the shoe and apron, keep the horizontal pressure between the sliding shoes and the tank shell substantially constant. The narrow gaps at the top, bottom and sides of the steel aprons are sealed with narrow strips of flexible materials which are wear resistant and which will withstand deterioration caused by petroleum vapors and atmospheric conditions.

A secondary wiper seal, consisting of a loop of similar flexible materials, is provided to exclude air currents and to improve the seal. Auxiliary roller guides, attached to the floating roof and held against the tank shell by compression springs, are provided to keep the roof centered in the tank and to prevent its rotation as it rises and falls.

Deck drains are so designed and arranged that water, collecting on the roof, is quickly conducted out of the tank

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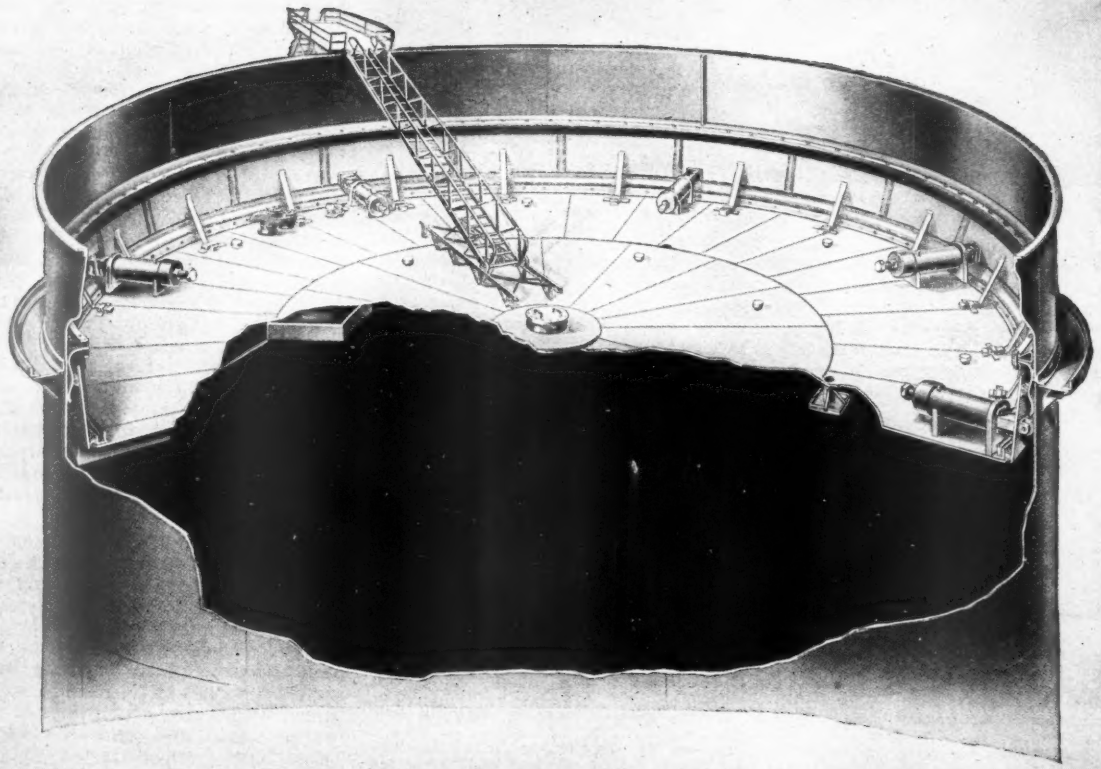

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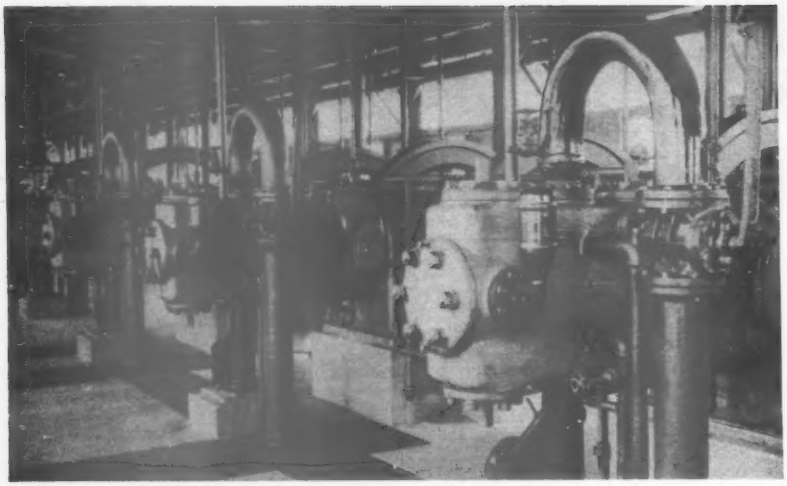


*Fig. 7—Huntington Beach propane compressors*

er. By limiting the probable discharge pressure the compressor cylinder can be rated for greater capacity. Since the vapor to be bled is at the bubble point, it can be shown that relatively small quantities of vapor need be removed, with the best results secured by bleeding this equilibrium vapor slowly (see actual analysis data in Table 1). For any temperature, vapor should be bled until the pressure is reduced to its allowable maximum (Fig. 2).

We call the propane refrigerant that reaches this vapor pressure limitation a "plant propane." This is the type of material under consideration in this paper. Unless the propane feed is consistently very pure, the plant propane should represent an average propane refrigerant.

Another point that is important in considering the use of plant propane is the fact that the light ends in this refrigerant are flashed upon expansion into the chilling unit at a greater rate than the propane itself. The bulk of the propane requires additional heat before flashing into the vapor phase. As a result there is a greater proportional circulation of these light ends than there is of the pure propane. In actual operation the analysis that is secured at the intake to the compressors will show more of these light fractions than will be in the average propane in the chillers or in the system (Table 1). The extent of this condition is dependent upon the relative volume of propane in comparison with the vapor space in the same system and to the rate of circulation of the refrigerant. A large system and a light load could easily result in a circulation of much higher percentages of light ends than would be secured at high circulation rates. The analysis we have used for plant propane takes into consideration the effects of the average rate of the circulation of these light ends and can be used for typical operations without unreasonable errors.

For these analyses, previous curves and data, a practical Mollier diagram has been developed (Fig. 3) which has been adjusted for actual operating values. This enthalpy chart shows the amount of heat in a pound of the plant propane plotted against pressures, with lines of constant temperatures shown between the lines of saturated liquid and saturated vapor. These have been corrected for the

*(Continued on page 180)*

**TABLE 1—PROPANE ANALYSIS**

| Analysis—Mol per cent | "A" | "B" | "K" | "D" | "E" | "F" |
|---|---|---|---|---|---|---|
| Carbon Dioxide | 2.10 | 0.30 | 7.00 | 0.00 | 0.15 | 0.10 |
| Methane | 7.35 | 0.51 | 14.41 | 0.00 | 0.19 | Trace |
| Ethane | 7.69 | 2.88 | 2.67 | 0.04 | 2.33 | 1.23 |
| Propane | 82.70 | 95.95 | 0.86 | 98.54 | 96.95 | 98.30 |
| Isobutane | 0.16 | 0.36 | 0.44 | 1.03 | 0.38 | 0.37 |
| Normal Butane | 0.00 | 0.00 | | 0.39 | 0.00 | Trace |
| Total | 100.00 | 100.00 | | 100.00 | 100.00 | 100.00 |
| Specific gravity | 1.421 | 1.531 | | 1.551 | | |

**REMARKS**

"A"—Condenser accumulator vapor — 172 psia. and 79° F.

"B"—Condenser accumulator liquid — 172 psia. and 79° F.

"Plant propane" before any bleeding—vapors to compressor.

"K"—Equilibrium constants, "A/"B."

"D"—Liquid in chiller—lube oil removed.

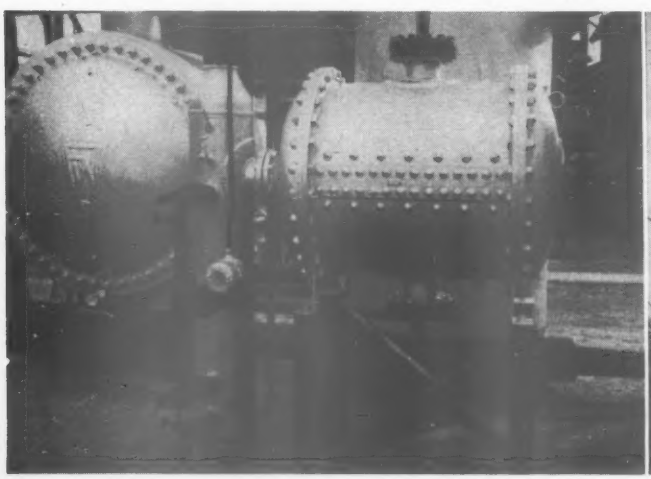
"E"—Condenser accumulator liquid — 162 psia. and 79° F.

"Plant propane" after bleeding approximately 10 per cent off "B."

"F" — Plant propane" from Signal Hill plant.

Specific gravity taken by Edwards balance.

"A" to "D" samples secured at Huntington Beach before bleeding and "E" after bleeding.



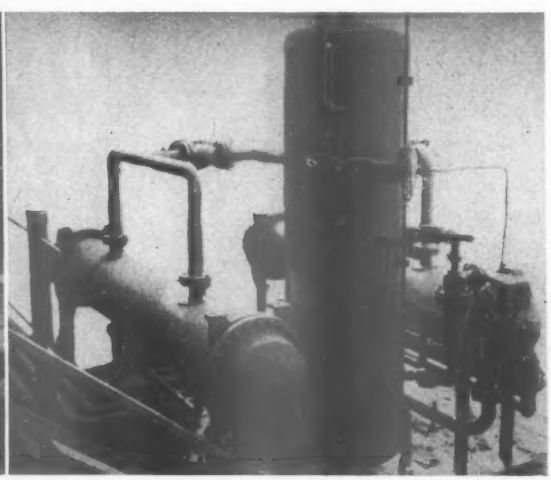


***Fig. 8—(Left) Signal Hill superheater and scrubber. The surge tank actually serves as a scrubber in this plant so that this unit serves as a means of installing a float and the magneto ground. Fig. 9—(Right) Huntington Beach gasoline chillers. Note separate surge tank and level control for semiindependent operation***

# Discoveries and Development of West Texas Pre-Permian Reaching Major Proportions

*by Charles J. Deegan*

**In West Texas and Southwest New Mexico, discoveries and development activities in deeper, and geologically older pays have been gradually accumulating in importance during a period when this growth has been obscured by war news. This is the first of a series of articles summarizing the present development status and geology of the fields producing from pays below the Permian.**

THE term "Pre-Permian," originally a geological description, has become a classification in West Texas and Southeast New Mexico that is widely used by drilling contractors, petroleum engineers, production men, pipe liners, and refiners, as well as the geologists.

It applies to all geological formations, deeper and older than the Permian lime, from which the main production of this area still comes. However, the drilling contractors soon found that drilling below the Permian brought special problems of considerable magnitude, far beyond those arising from increased depth. The petroleum engineers and production men soon found that they, too, had special problems in dealing with the reservoir conditions in these Pre-Permian pools. The pipe liners and refiners found the classification important because in general the oil from Pre-Permian pools was much higher in gravity than the Permian lime, and that although not completely sweet, the sulfur content averaged quite a bit lower than in Permian oils.

### Today's Over-all Picture

With the substantial exception that the general service facilities built for Permian production are available, Pre-Permian developments in this area might just as well be in an entirely new producing region. There are advantages in blanking out all Permian pool data, since it makes it easier to grasp the over-all picture of the Pre-Permian as it stands today. For this reason, the maps and table presented in this article omit all information except that pertaining to Pre-Permian development.

Like many major developments, the Pre-Permian had a slow growth, which gradually increased in momentum, until now it has hit a pace which, if continued, will soon make it the dominant feature of the West Texas-Southeast New Mexico region. The period when it was picking up momentum was one in which much news was blanketed by war headlines, and many people outside the immediate region have not been aware of its importance.

As of January 1, 1946, about 38 new Pre-Permian fields had been discovered, and counting multiple pays, about 54 pools had been found and were being produced. The exact number of pools is difficult to count, because in some fields there are intermediate pays, particularly Simpson (Ordovician), that are known to be productive, but which are not being tapped at this time. In others, there is now reason to believe that perhaps Devonian chert pay may be found that was passed up originally. Fig. 1 shows the location of the more important of these fields.

During 1945 the bulk of the development drilling was concentrated in four fields, Keystone in Winkler County leading with 47 completions; TXL, in Ector County, second with 42 completions; Todd Deep, in Crockett County, third with 22 completions, and Fullerton, just getting under way, fourth with 15 completions. The above do not include discoveries and extension wells, classified as wildcats. A complete list of all Pre-Permian fields is shown in Table 1.

The first discovery was at Big Lake in Reagan County in 1928 when deeper drilling developed production in the Pennsylvanian and also in the Ellenburger lime. There were no further developments until 1936, when Simpson production (Ordovician and very similar to the Simpson section of Oklahoma) was found in the Sand Hills area of Crane County. Another lapse, and in 1939 the Apco-Warner field of Pecos County was developed in the Ellenburger.

The year 1940 marked the beginning of a real Pre-Permian development. Ellenburger production was found in the Sand Hills area of Crane County; Pennsylvanian production (probably Strawn equivalent) was

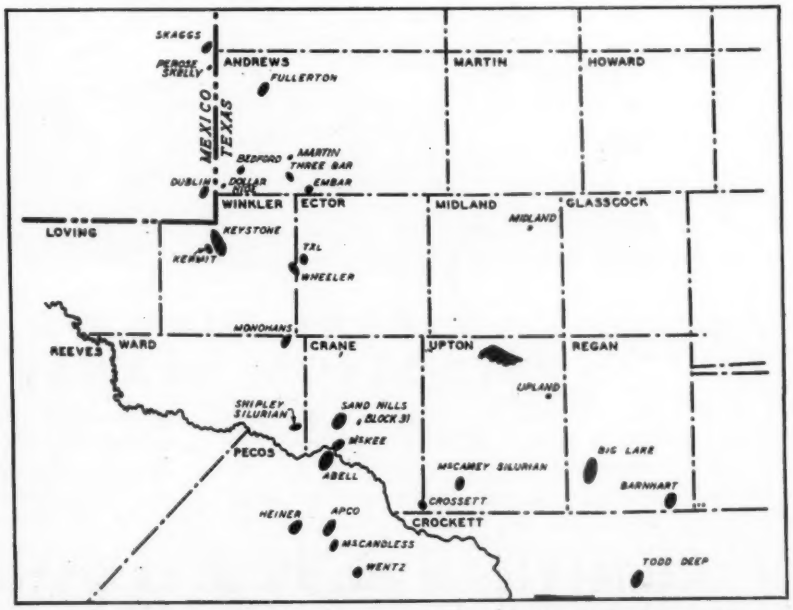
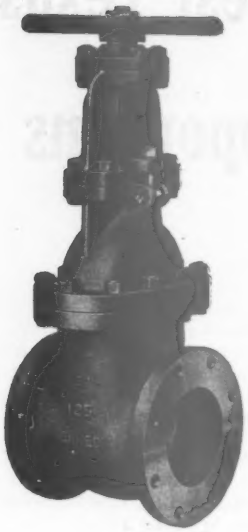



*Fig. 1—Pre-Permian fields of West Texas-Southeast New Mexico. (Base map courtesy Zingery Map Co.)*



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found in the Todd Deep field of Crockett County; Simpson production was developed in the Abell field of Pecos County; and the first Silurian oil was found in the Shipley-Silurian field of Ward County.

In 1941 two more Ellenburger and one more Simpson strikes were added to the Sand Hills area of Crane County; the Heiner and Wentz fields in Pecos County, both producing from Ellenburger were found, with some production also being found at Wentz in a sand believed to be Cambrian in age; and Reagan County completed the list with the discovery of the Barnhart field, an Ellenburger lime producer.

During 1942, in spite of the wartime difficulties, new discoveries were again frequent. The Embar field, in Andrews County, found production in the Ellenburger; Coke County came into the picture with the Blackwell field producing from the Pennsylvanian; Concho County entered the list with the Dodson field getting production from Pennsylvanian, after failing in the Ellenburger; Crane County came through with Simpson production at McKee; the Page gas field in Schleicher County produced from Pennsylvanian; the Allison gas field of Sutton County also produced from Pennsylvanian; and the Ellenburger was found productive at Monahans, in Ward County.

### Fewer Discoveries in 1943

In 1943, as the wartime pinch on materials and manpower became more severe, the number of new discoveries was smaller, but among the five discoveries of the year was Keystone-Ellenburger, in Winkler County, one of the best found to date. The others for the year were McCandless in Pecos County; another Silurian discovery, the McCamey Silurian in Upton County, and the Kermit-Ellenburger and Wheeler-Ellenburger, both in Winkler County.

In 1944, in addition to development work in previously discovered fields, New Mexico joined West Texas, with the discovery of Ellenburger oil in the Dublin field of Lea County, and possibly Pre-Permian oil in the Skaggs Deep field of the same county. There may be some question about Skaggs, whether it is Abo (Wolfcamp) and therefore basal Permian, or something lower in the geological section and therefore Pre-Permian.

In West Texas, at the Fullerton field in Andrews County, Devonian production, labeled the 8,500-ft. pay, entered the Pre-Permian picture for the first time, in what has since proven to be a very important development for possibly the entire region. Devonian production was also found in the Crossett field of Crane County, and that county also had another Ellenburger strike in the Sand Hills area. In Crockett County, the Todd Deep field, previously producing from Pennsylvanian, was discovered to have even better producing potentialities in the Ellenburger, but the discovery well was not produced, being plugged back to the Pennsylvanian. In Ector County, the TXL field was opened in the Devonian, and subsequent developments indicate that this was also a major strike.

The year 1945 has been the banner year to date for Pre-Permian, with 12 new fields opened, and counting multiple pays, about 20 new pools. New Mexico came through again with the discovery of Ellenburger production in the Penrose-Skelly field of Lea County. Andrews County, Texas, seemed to be in the limelight all year, with "hot" wildcats that in most instances came through. In March, the Three Bar pool was opened in the Devonian; in August, another Devonian pool was opened at Dollar Hide; in November the Bedford field was opened with production in both Devonian and Ellenburger; while in the same month the Martin field, a March 1945 Permian discovery, was found to be productive in the Simpson. In December, the Fullerton field, where active development had been going on in the 8,500-ft. Devonian pay, found Ellenburger production.

In Concho County, in May, a gas field (and possibly condensate) tentatively called Eden gas, located ¾ mile northwest of the town of Eden, was completed in the Pennsylvanian. In October, an oil producer from the Pennsylvanian was discovered about 4 miles northwest of Eden, and is usually called the Eden pool.

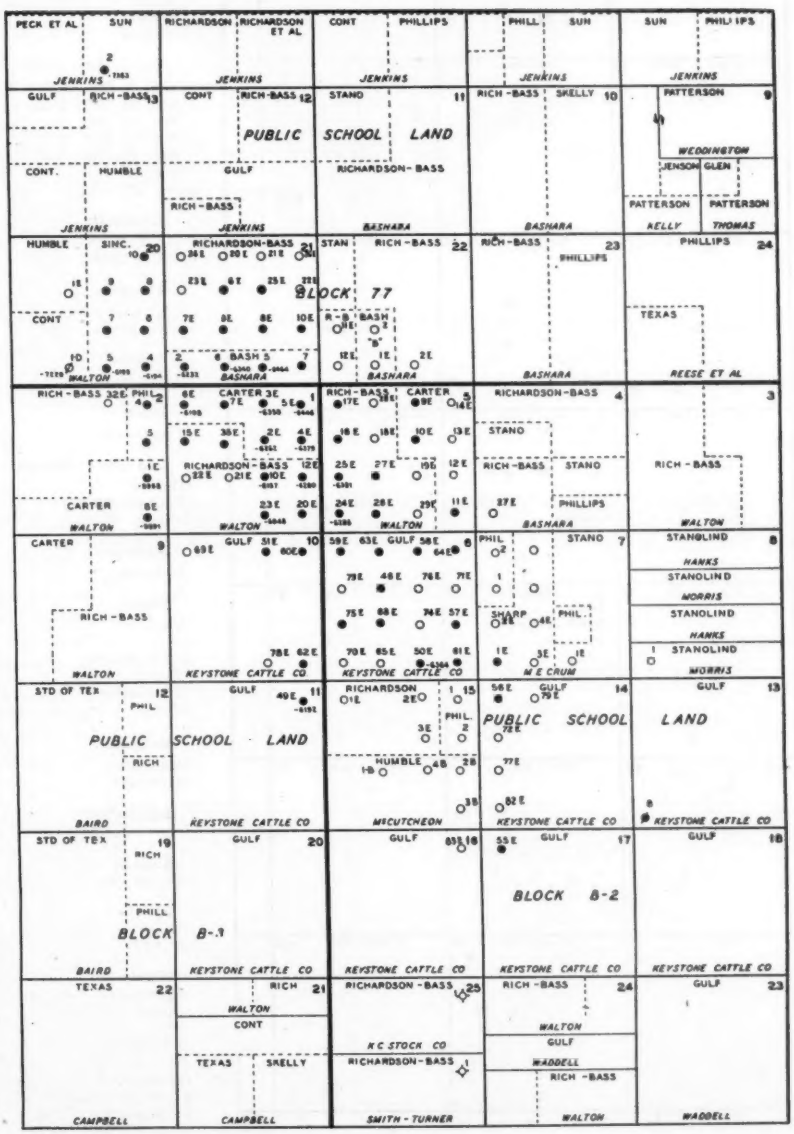



*Fig. 2—Pre-Permian development in Keystone field, Winkler County. (Base map courtesy Southwestern Mapping Co.)*

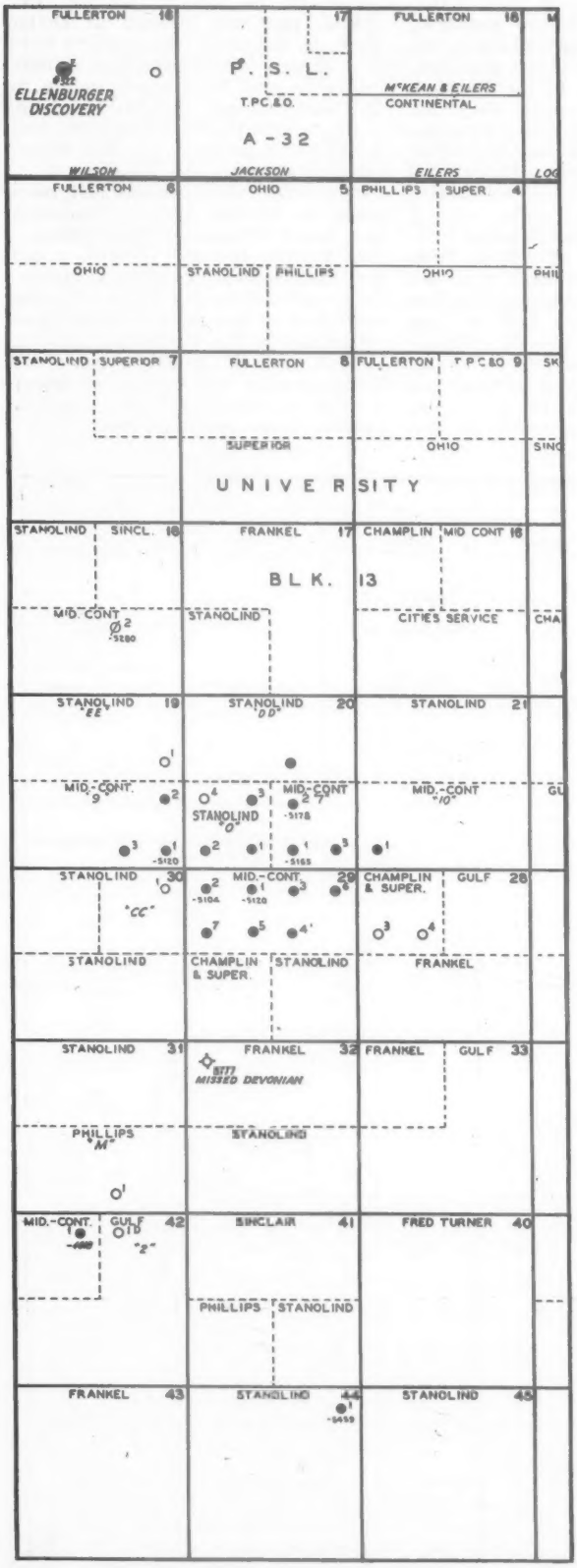



***Fig. 3 — Pre-Permian development in Fullerton field, Andrews County. (Base map courtesy University Lands)***

**TABLE 1 — PRE-PERMIAN POOLS — WEST TEXAS — S. E. NEW MEXICO (AS OF JAN. 1, 1946)**

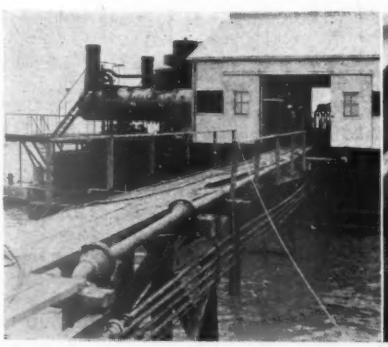
| County and pool— | Year discovered | Gravity (°A.P.I.) | Approx. depth | Formation Producing |
|---|---|---|---|---|
| **Andrews:** | | | | |
| Bedford Devonian | 1945 | ... | 8,900 | Devonian |
| Bedford Ellenburger | 1945 | ... | 11,000 | Ellenburger |
| Dollar Hide | 1945 | ... | 7,900 | Devonian |
| Embar | 1942 | 44° | 7,800 | Ellenburger |
| Fullerton 8,500 | 1944 | 40° | 8,500 | Devonian |
| Fullerton Ellenburger | 1945 | ... | 9,900 | Ellenburger |
| Martin-McKee | 1945 | ... | 8,800 | Simpson |
| Three Bar | 1945 | 41° | 8,400 | Devonian |
| **Coke:** | | | | |
| Blackwell | 1942 | 41° | 3,800 | Penna. |
| **Concho:** | | | | |
| Dodson | 1942 | ... | .... | Penna. |
| Eden Gas | 1945 | ... | 3,300 | Penna. |
| Eden | 1945 | ... | 3,800 | Penna. |
| **Crane:** | | | | |
| Block 31—Devonian | 1945 | ... | 8,900 | Devonian |
| Block 31—Ellenburger | 1945 | ... | 10,300 | Ellenburger |
| Crossett | 1944 | 45° | 5,400 | Devonian |
| McKee | 1942 | 43° | 6,200 | Simpson |
| Sand Hills area: | | | | |
| Sec. 4, Blk. B-27 | 1936 | 37° | 6,000 | Simpson |
| Sec. 20, Blk. B-27 | 1940 | 38° | 5,800 | Ellenburger |
| Sec. 12, Blk. 3 | 1941 | 42° | 6,000 | Simpson |
| Sec. 15, Blk. 3 | 1941 | 37° | 5,600 | Ellenburger |
| Sec. 28, Blk. B-27 | 1941 | 36° | 5,600 | Ellenburger |
| Sec. 20, Blk. B-26 | 1944 | 44° | 5,900 | Ellenburger |
| Sec. 25, Blk. 1 | 1945 | ... | 5,800 | Simpsor |
| **Crockett:** | | | | |
| Todd Deep | 1940 | 42° | 5,900 | Penna. |
| Todd Deep | 1945 | 41° | 6,300 | Ellenburger |
| **Ector:** | | | | |
| TXL Devonian | 1944 | 41° | 8,000 | Devonian |
| TXL Ellenburger | 1945 | 43° | 9,800 | Ellenburger |
| **Gaines:** | | | | |
| Jones Ranch | 1945 | ... | 11,400 | Devonian |
| **Irion:** | | | | |
| Tankersley | 1945 | ... | 7,200 | Penna. |
| **Lea (New Mexico):** | | | | |
| Dublin | 1944 | 48° | 11,900 | Ellenburger |
| Penrose-Skelly | 1945 | ... | 8,100 | Ellenburger |
| Skaggs Deep | 1944 | 43° | 7,700 | Questionable |
| **Midland:** | | | | |
| Midland | 1945 | 43° | 10,400 | Penna. |
| **Pecos:** | | | | |
| Abell | 1940 | 42° | 5,400 | Ellenburger and Simpson |
| Apco-Warner | 1939 | 41° | 4,600 | Ellenburger |
| Heiner | 1941 | 35° | 5,400 | Ellenburger |
| McCandless | 1943 | 35° | 4,000 | Ellenburger |
| Wentz | 1941 | 33° | 4,300 | Ellenburger and Cambrian |
| **Reagan:** | | | | |
| Big Lake | 1928 | 44° | 8,200 | Penna. & Ellenb. |
| Barnhart | 1941 | 44° | 9,000 | Ellenburger |
| **Schleicher:** | | | | |
| Page | 1942 | 42° | 5,600 | Penna. |
| **Sutton:** | | | | |
| Allison Gas | 1942 | ... | 3,800 | Penna. |
| **Upton:** | | | | |
| McCamey Silurian | 1943 | 43° | 7,200 | Silurian |
| Upland | 1945 | ... | 9,800 | Penna. |
| **Ward:** | | | | |
| Monahans | 1942 | 47° | 10,400 | Ellenburger |
| Shipley Silurian | 1940 | 32° | 7,100 | Silurian |
| **Winkler:** | | | | |
| Kermit-Ellenburger | 1943 | 41° | 10,800 | Ellenburger |
| Keystone-Ellenburger | 1943 | 40° | 9,700 | Ellenburger |
| Keystone-Silurian | 1945 | 31° | 8,600 | Silurian |
| Wheeler-Devonian | 1945 | 34° | 8,500 | Devonian |
| Wheeler-Ellenburger | 1943 | 46° | 10,700 | Ellenburger |

Total—51 pools.

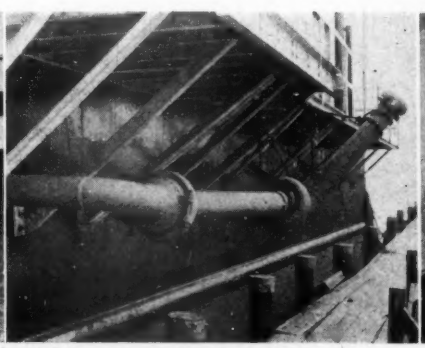
# UNIBOLT "FLEXI-BALL" JOINTS

Here is a flexible joint for steam lines, misaligned connections, flexible manifolds, pressure-operated blowout preventer manifolds, rotary hose connections to standpipe and swivel, etc., whose life span is far greater than that of similar fittings. *Flexi-Ball Joints can be kept in service indefinitely and can always be dismantled with an end wrench because there are no threads between its component parts to gall and freeze,* Like other UNIBOLT Couplings, releasing a single bolt breaks the joint; tightening the bolt effects a seal. Complete interchangeability—another UNIBOLT characteristic—assures maximum economy due to replaceable parts. All Flexi-Ball Joints are designed for high pressure service and can, therefore, be switched at will from steam lines to mud lines.

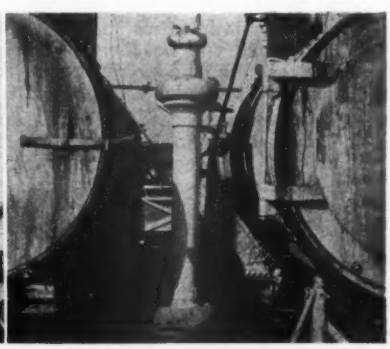
**THORNHILL-CRAVER CO.**
**HOUSTON, TEXAS**



*6-inch Flexi-Ball Joints on steam line from boiler barge to drilling barge.*



*6-inch Flexi-Ball Joints on a boiler barge steam line.*



*6-inch Flexi-Ball Joints on a boiler "drop."*

Crane County had a dual discovery in the Block 31 pool, producing from both Devonian and Ellenburger, completed in November. In addition there was another Simpson strike in the Sand Hills area. Crockett County's Todd Deep field had Ellenburger production, discovered in 1944 but passed up, opened for development in February.

In Ector County, the TXL field, which developments during 1944 and early 1945 had indicated might well be a major field in the Devonian alone, had an Ellenburger discovery completed in May, and about the same time, had drill-stem indications in the Silurian that that formation would probably produce large quantities of oil.

Midland County came into the producing ranks for the first time in any pay, with a Pennsylvanian producer completed in November. In Upton County, the Upland field, producing from the Pennsylvanian, was opened in July.

Two of Winkler County's previous discoveries were developed in new and shallower Pre-Permian pays. In March, Devonian production was established in the Wheeler-Ellenburger pool, and in June, Silurian production was brought in in the Keystone-Ellenburger field.

### Pay Firmly Established

It is obvious from this brief review of the exploratory and development activity, that the Pre-Permian play is now firmly established as a major regional development. It has all the earmarks that go with the finding of an important petroliferous region. Early discoveries were few, the play was slow in developing, but gathered momentum from its own successes. As interest spread, and more wildcats were drilled to these horizons, the number of new fields found increased rapidly.

It is significant that the latest year was the largest in number of discoveries and in development drilling. It is perhaps even more significant that the last half of the year saw more important discoveries than the first half. This indicates that the peak of activity lies some time in the future, a fact which will be developed more fully from the standpoint of the geological prospects in a future article.

From the depth data in Table 1, and the map shown in Fig. 1, it will be seen that the depth to the various Pre-Permian formations increases sharply from south to north along the Pecos County-Andrews County trend. This is due to the controlling regional geological feature known as the Central Basin platform, which will be dealt with more fully in another article.

Incidentally the geologists and company officials who had once believed that development in the shallower Permian pays offered what amounted to a core-drill map of the subsurface structure that would control eventual deeper drilling have found their hopes completely blasted. Finding Pre-Permian fields calls for first-class exploration work, or as always, good luck.

At the present time, the depths required and the costly drilling problems involved, put Pre-Permian exploration and development in the major investment class, despite the availability of nearby supply and service sources that have been built up on a large scale over a period of 20 years during the development of Permian production.

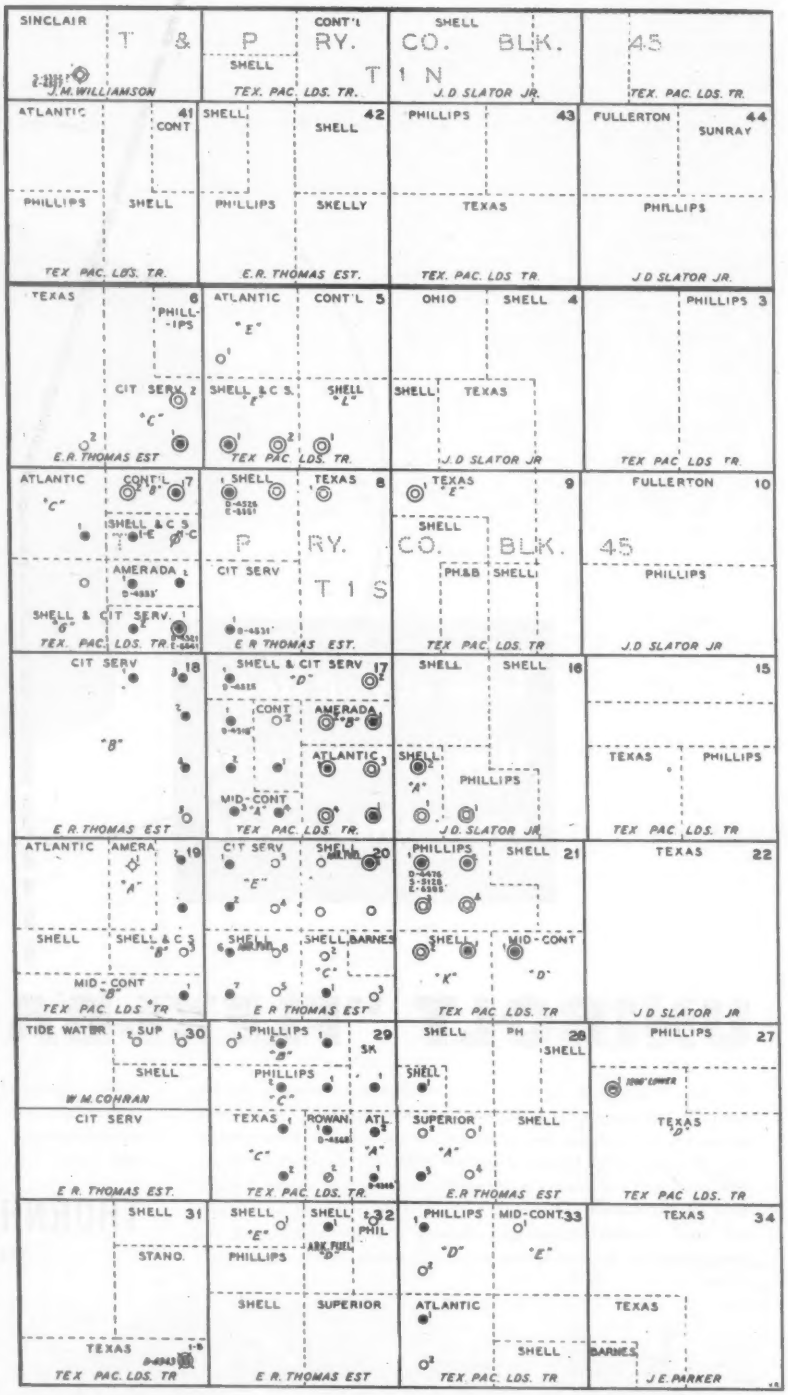



*Fig. 4—Pre-Permian Development in TXL field, Ector County. (Base map courtesy Southwestern Mapping Co.)*

*Above: West Pampa field supervisors in session at Pampa senior high school. Right: Advisory committee of the West Pampa supervisory training conferences: J. W. Chervenka, The Texas Co.; Dallas Bowsher, Skelly Oil Co.; F. F. Thomason, Sinclair Prairie Oil Co.; Fred Neslage, West Pampa Repressuring Association, committee chairman; E. L. Chapin, Stanolind Oil & Gas Co., conference leader; Norman Perkins, Phillips Petroleum Co., 1946 chairman of the Panhandle chapter; and R. B. Wilkins, Phillips Petroleum Co. Committee members not shown are J. E. Gray, Shell Oil Co., Inc., and H. F. Nabors, Continental Oil Co.*

**by John Woodruff***

# Personnel Training on Repressuring Project

RECENT completion of a series of 10 conferences of production supervisors in the West Pampa pool of the Texas Panhandle field marked the end of a cooperative training program of almost 2 years' duration to prepare field personnel for the beginning of gas injection on the large West Pampa repressuring project. The supervisory conferences were inaugurated last October after detailed plans for the operation of the gas injection project had been drawn up (see The Oil and Gas Journal, February 10, 1945, pp. 74-79). Personnel training in this area was started, however, early in 1944 in an effort to give all field personnel general background information on the over-all problem of repressuring in a dolomite pool, such as West Pampa.

On March 21, 1944, in Pampa and Borger, evening-study groups were organized with 125 men participating. Ultimately similar groups were organized at Lefors and Kellerville to bring the total number of enrollees to more than 200. The curriculum set up for these groups comprised elementary geology, principles of reservoir control, mathematics, principles of gas measurement, and principles of secondary recovery. Study material was prepared locally by committees and related especially to the two main types of pay formation found in the area, namely, dolomite and granite wash.

By the time the West Pampa Repressuring Association's organization had been perfected, involving 26 producing companies, the basic training of field personnel had been substantially completed. Speaking for the oil industry of the area was the Panhandle Chapter of the A.P.I. production division. Cooperating public agencies included the Texas State Board for Vocational Education; University of Texas, Division of Extension; the Pampa public schools, and the West Pampa Repressuring Association.

### Training Closes With Conferences

The preparatory training program was closed with a series of 10 conferences of production supervisors of all operators interested in the West Pampa project. Responsibility for planning the supervisor's conferences was delegated to an advisory committee appointed by Dallas Bowsher, Skelly Oil Co., 1945 chairman of the Panhandle A.P.I. chapter.

Topics for the conference were set up by the advisory committee to serve a dual objective: (1) Review of basic principles governing the proposed secondary recovery program; (2) precise and detailed information as to the responsibilities of the agencies concerned with repressuring of the West Pampa pool.

The conference series comprised such typical topics as geology of the West Pampa pool; production history of the field: the West Pampa Repressuring Association and its functions; responsibilities of the service agents for gas handling; designation and preparation of injection wells; field control of gas injection; evaluating repressuring progress; keeping records and reports; and cooperation on a repressuring project.

Attendance at the concluding conference and all of the previous courses in the 2-year program was voluntary. More than 95 per cent of the supervisory personnel of West Pampa operators participated in the meetings, the total enrollment being 80. While it is difficult to evaluate the relative value of any program of education in precise terms, the consensus of the men in West Pampa pool was that a great deal was accomplished by the program.

Men most active in the program do not consider that the job of training is necessarily finished, and the advisory committee is being continued on stand-by status to organize to meet any future needs for personnel training on the project.

*State coordinator of petroleum industry training, University of Texas.

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# Bearing CORROSION

**by H. H. Zuidema**

**PART 2**

**This is the second of three parts of an article based on a comprehensive survey of the literature as well as the results of investigations by the Wood River research laboratories of Shell Oil Co., Inc., with which the author has been associated for the past 10 years. The first part of the series was published last week, and the third will appear in an early issue.**

AS mentioned earlier, bearing metals differ widely in their resistance to corrosion. This is illustrated in Table 1, in which data published by Tichvinsky[29] are reproduced. The data are from Underwood tests*, in which oil is circulated at 325° F. and impinged upon bearing specimens. Catalysis was supplied by means of copper baffles in the machine. Various S.A.E. 30 grade oils were used. Table 1 shows the lead-base babbitts to be attacked to a greater extent than tin-base babbitt; however, all four babbitts were practically inert in comparison with the other four alloys. Cu-Pb (coarse structure) and alkali hardened lead were roughly equivalent in this test, with Cd-Ag more reactive by a factor of four, and Cd-Ni by a factor of six. These factors are not regarded as absolute, since they vary with the oil used and with test conditions. Furthermore, the conditions of the Underwood test and engine operation differ markedly. However, a general trend is indicated in Table 1. Underwood tests conducted at Emeryville and at Wood River have in general rated babbitt, copper-lead, and cadmium-silver in the order shown in Table 1.

*The Underwood and a number of other bearing corrosion tests are described briefly in Table 5.

Similar trends have been shown by Waters and Burnham[36], who used the Existent Corrosivity, or E.C. test, in which a test specimen is immersed in oil at 313° F. for 20 minutes, during which time the oil is agitated by aeration at a fixed rate; and by Talley, Larsen, and Webb[28], who used the Trust Bearing Corrosion, or T.B.C., test, in which a bearing surface is subjected for 20 hours to a wiping action by steel at a pressure of 125 psi. and a temperature of 225° F. The results are summarized in Table 2. It will be observed that the babbitts were attacked to a negligible extent, with indium-plated copper-lead next in order, copper-lead next, and the cadmium alloys attacked to the greatest extent.

Raymond[25] compared various bearing metals in an engine test. His results on four alloys are summarized in Table 3. He found cadmium-silver to be most corroded, with indium-plated cadmium - silver, copper - lead, and alkali hardened lead considerably more resistant to attack.

Raymond investigated the effect of the structure of copper-lead upon its corrodibility. A regular coarse-structure alloy was compared with a special fine-structure alloy in a 100-hour test run in a diesel engine. The results are shown in Table 4. It will be observed that the fineness of structure is an important factor in corrosion. The average weight loss for the 11 fine-structure shells was 1.365, which is less than the average figure of 4.363 for the coarse-structure shells by a factor of 3.2. The probable explanation is that the lead, which is corroded preferentially, is more readily accessible in the coarse than in the fine - structure alloy. Fine - structure copper-lead is said to have superior mechanical strength as well as corrosion resistance. Manufacturing facilities have apparently prevented its general use.

### Making Metals Less Corrodible

As mentioned previously, bearing metals can be made less corrodible by covering the surface with another metal or alloy, e.g., the indium-plated cadmium-silver bearings discussed by Raymond, and the Buick sandwich bearing, which consists of a steel shell, covered with a layer of a sin-

**TABLE 1—CORROSION OF VARIOUS BEARING METALS IN UNDERWOOD TEST AT 325° F. IN PRESENCE OF METALLIC COPPER**

Data from Tichvinsky[29]

| Bearing metal— | Composition, per cent | | | | | | | | | | | | | No. of tests | Avg. wt. loss grams/hr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sn | Pb | Sb | Cu | Cd | Ag | Ca | Al | Zn | Mg | Fe | Ni | As | | |
| Tin-base babbitt | 88.0 | 0.35 | 7.5 | 4.0 | .... | .... | .... | .... | .... | .... | 0.03 | .... | 0.1 | 17 | 0.001 |
| Arsenic-lead-base babbitt | 1.0 | 82.5 | 15.0 | 0.5 | .... | .... | .... | .... | .... | .... | .... | .... | 1.0 | 13 | 0.002 |
| Silver-lead-base babbitt | 2.0 | 77.75 | 15.0 | 0.25 | .... | 5.0 | .... | .... | .... | .... | .... | .... | .... | 4 | 0.002 |
| Lead-base-babbitt | 5.0 | 80.0 | 14.0 | 0.3 | .... | .... | .... | .... | .... | .... | .... | .... | 0.2 | 7 | 0.004 |
| Alkali-hardened lead | 1.0 | 98.0 | .... | .... | .... | .... | 0.5 | 0.07 | .... | 0.08 | 0.01 | .... | .... | 50 | 0.427 |
| Copper-lead, coarse structure | .... | 25.0 | .... | 75.0 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 65 | 0.453 |
| Cadmium-silver | 0.0 | 0.02 | .... | 0.5 | 98.0 | 1.0 | .... | .... | 0.02 | .... | .... | .... | .... | 62 | 1.742 |
| Cadmium-nickel | 0.1 | 0.01 | 0.18 | 0.04 | 97.8 | .... | .... | .... | .... | .... | .... | 1.8 | .... | 4 | 2.424 |

**TABLE 2—RELATIVE CORRODIBILITY OF DIFFERENT BEARING METALS IN EC AND TBC TESTS**

| Bearing metal— | Wt. loss in E.C. test, Mg/Sq. Cm.* data from Waters and Burnham[36] | Wt. loss in T.B.C. test, Mg/Sq. Cm.* data from Talley, Larsen & Webb[28] |
|---|---|---|
| Tin base babbitt | 0.06 | 0.20, 0.28 |
| Lead base babbitt | ... | 0.12, 0.41 |
| Indium-plated copper-lead | 1.0 ± 0.1 | ..... |
| Copper-lead | 1.4 ± 0.2 | 28.2, 28.7, 25.9, 28.9 |
| Cadmium-nickel | 1.65 ± 0.05 | 30.3, 36.5 |
| Cadmium-silver | 1.8 ± 0.0 | 31.1, 40.0 |

*An S.A.E. 10 grade oil containing undecyclic acid to a neutralization number of 2.0 was used in the E.C. measurements, and a corrosive reference oil in the T.B.C. tests.

**TABLE 3—COMPARISON OF CONNECTING-ROD BEARINGS IN 8-CYLINDER PASSENGER CAR ENGINE AT 300° F. BASE OIL TEMPERATURE**

Data From Raymond[25]

| Oil— | Wt. loss, grams/whole bearing | | | |
|---|---|---|---|---|
| | Regular Cd-Ag | In plated Cd-Ag | Cu-Pb | Alkali hardened Pb |
| Oil, F, Commercial non-additive | 4.021 | 0.447 | 0.361 | 0.415 |
| | 3.717 | .... | .... | .... |
| Oil F + Additive VI (inhibitor) | 0.179 | 0.013 | .... | .... |
| Oil J, Commercial, detergent | 4.995 | 2.323 | .... | .... |

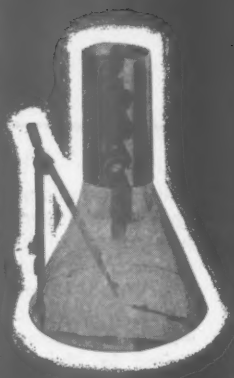

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**TABLE 4—COMPARISON OF COARSE AND FINE-STRUCTURE COPPER-LEAD BEARINGS**

Data From Raymond[28]—Oil Temperature 280° F.

| Oil— | Weight loss, grams/shell— Main bearing* Coarse | Main bearing* Fine | Connecting rod bearing† Coarse | Connecting rod bearing† Fine |
|---|---|---|---|---|
| Oil A + Additive I, (inhibitor, detergent) | 0.594 | 0.030 | 0.837 | 0.046 |
| Oil A + Additive I, (higher concentration) | .... | .... | 0.383 | 0.088 |
| Oil B. Non-additive | .... | .... | 5.755 | 2.740 |
| Oil B + Additive I | 4.595 | 0.153 | .... | .... |
| Oil B + Additive III, (inhibitor) | .... | .... | 1.650 | 1.037 |
| Oil E + Additive I | 8.077 | 2.186 | 3.518 | 0.268 |
| Oil E + Additive IV, (inhibitor) | 8.904 | 2.740 | 5.084 | 2.661 |
| Oil C, commercial additive | .... | .... | 8.596 | 3.061 |

*Lower shell only. †Upper shell only.

tered mixture of nickel and copper (40:60), which is in turn covered with a thin layer of babbitt.

The corrosion of cadmium-silver can also be prevented by the addition of a small amount of certain metals. Smart[27] found that cadmium alloys containing small amounts of zinc, tin, or indium were more resistant to corrosion than Cd-Ag or Cd-Ni. Ryan[28] showed that the weight loss of cadmium-silver which was exposed to a used lubricating oil for 16 hours at 340° F. was reduced from 24 to 13 mg. by the addition of 0.1 per cent antimony to the alloy, and to 7 mg. by the addition of 0.2 per cent. In view of these results it would appear that the corrosion resistance of lead-base babbitt may be due in part to its antimony content, which normally amounts to several per cent.

Since the relative corrodibility of bearing alloys is affected by test conditions, it is impossible to list the various alloys in order of their corrosion resistance without reservation. It may be stated, however, that under normal engine conditions coarse-structure copper-lead, alkali hardened lead, and the cadmium alloys are in general the most easily corroded. Babbitt is quite inert to corrosion. Fine-structure copper-lead, and specially treated bearings such as indium-plated cadmium-alloy, fall in an intermediate classification. Whether or not a given bearing corrodes depends upon a number of factors which will be discussed in a later section.

### Mechanism of Corrosion

Bearing corrosion may be of three types: (1) "acid" corrosion, (2) "sulfur" corrosion, and (3) corrosion by aqueous acids.

1. **Acid corrosion.**—This type is by far the most prevalent, and involves solution by an acid of a metal which is relatively high in the electromotive series in much the same manner that metals like zinc and iron are corroded or dissolved by aqueous solutions of acids. The metals commonly occurring in bearing alloys which are affected most by this type of corrosion are cadmium and lead. There is a distinction, however, between corrosion by aqueous acids and acids present in lubricating oils in that the former can act as oxidizing agents toward metals above hydrogen in the electromotive series and dissolve these metals with the evolution of gaseous hydrogen.

**TABLE 5—BEARING CORROSION TESTS**

**Based on Table 3 of Recent Paper by Larsen[19]**

| Test— | Reference | Test conditions— Atmosphere | Rate of circulation or stirring | Oil temp. (°C.) | Time, hours | Sample size | Catalyst, in addition to bearings | Special features and comments |
|---|---|---|---|---|---|---|---|---|
| Caterpillar | Willey and Prutton, S.A.E., White Sulfur Springs, 1940 | Air | 60 r.p.m. | 132 | 65 | 400 ml. | None | Cd-Ag bearing segment used as stirrer |
| Sohio* | Burk et al, Petroleum Div., A.C.S., Atlantic City, Sept. 1941 | Air | 30 liters/hr. | 154.4 | 20, 65 | 160 ml. | 300 sq. cm. steel, 20 sq. cm. copper | Catalyst area based on metals exposed in engine |
| Penn. State | Hersh et al, Refiner, 22, 197-205, July 1943 | Air | 10 liters/hr. | 175 | 20, 50, 80 | 100 ml. | 8.25 sq. in. iron, 15.75 in. No. 40 copper wire | Test similar to Sohio—both are oxidation tests as well |
| Underwood | Mougey, S.A.E. World Automotive Congress Reprints N. Y., 1939 | Air | ..... | 162.8 | 5, 10, 15 | 1,500 ml. | Copper or soluble metal naphthenates | Oil sprayed through air and impinged on bearing specimens |
| Stirring Ind. | Lamb et al, Ind. Eng. Chem. Anal. Ed. 13, 317-21, 1941 | Air | 1,300 r.p.m. | 165.6 | 72 | 250 ml. | 5 sq. cm. Cu, 10 sq. cm. Fe | |
| MacCoull | MacCoull et al, S.A.E. J. 50, 338-45, 1942 | Air | 3,000 r.p.m. | 176.7 | 10 | 125 ml. | Copper | Special sleeve bearing rotated about stationary steel shaft |
| C & S (Corrosion & Stab.) | Waters et al, Ind. Eng. Chem. Anal. Ed. 15, 550-9, 1943 | Air | 1,310 r.p.m. | 184 | 3, | 225 g. | None | Rotor serves as stirrer and bears felt pad which wipes bearing surface |
| E C (Existent Corsivity) | Waters & Burnham, Ind. Eng. Chem. 36, 263-71, 1944 | Air | 6.3 ml./min. | 156 | 0.33 | 20 g. | None | Measures corrosivity of an oil in a given state—it is not a stability test |

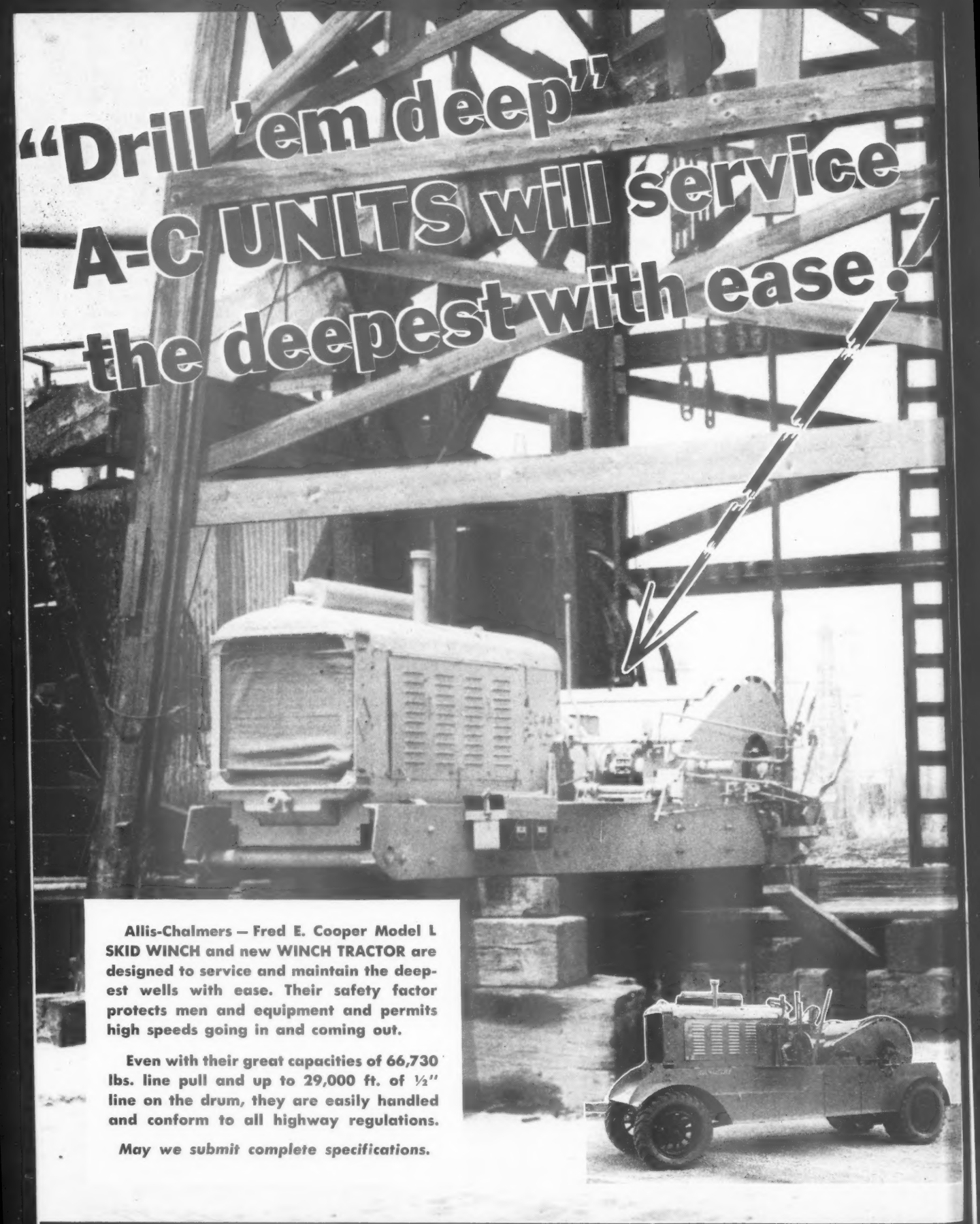
*In a recent paper (N. Y. A.C.S. meeting, Sept. 1944) the Sohio test was revised as follows: Air flow increased to 70 liters/hr., temp. reduced to 133.7° C., time standardized at 36 hr., metallic iron and copper increased to 300 and 20 sq. cm., respectively, and soluble iron and lead added in the form of ferric 2-ethyl hexoate (0.012 per cent as $Fe_2O_3$) and lead bromide (0.1 per cent). The revised test is designed to correspond to the 36-hr. Chevrolet (L-4) test.

| Test— | Reference | Test conditions— Atmosphere | Rate of circulation or stirring | Oil temp. (°C.) | Time, hours | Sample size | Catalyst in addition to bearings | Special features and comments |
|---|---|---|---|---|---|---|---|---|
| Sunbury | Tichvinsky, Electro-Chem. Soc. Preprint 85.2 | Air | 680 r.p.m. | 160 | 20 or more | 400 ml. | Copper | Bearing segment used as stirrer |
| T.B.C. (Thrust Bearing Corrosion) | Talley et al, Petroleum Div. A.C.S., Atlantic City, Sept. 1941 | Air | 2,400 r.p.m. 50 ml./min. | Various | 20 | ..... | None | Bearing surface slides over steel surface, providing oil shear |

In addition to the above laboratory tests, the following engine tests, all of which have been standardized by the CRC. include an evaluation of bearing corrosion.

| CRC. designation— | Engine | Test conditions— Load, b.hp. | Jacket outlet temp., °F. | Oil temp., °F. | Speed, r.p.m. | Test duration, hours |
|---|---|---|---|---|---|---|
| L-3-1143 | 4 cylinder Caterpillar diesel | 37 | 200 | 212 | 1,400 | 120 |
| L-4-1143 | Chevrolet | 30 | 200 | 265 for 10 grade 280 for 30 grade and 50 grade | 3,150 | 36 |
| L-5-1143 | G.M. diesel, 3, 4 or 6 cylinder | 27 per cyl | 180 | 230 | 2,000 | 500 |

# "Drill 'em deep" A-C UNITS will service the deepest with ease!



**Allis-Chalmers — Fred E. Cooper Model L SKID WINCH and new WINCH TRACTOR are designed to service and maintain the deepest wells with ease. Their safety factor protects men and equipment and permits high speeds going in and coming out.**

**Even with their great capacities of 66,730 lbs. line pull and up to 29,000 ft. of ½" line on the drum, they are easily handled and conform to all highway regulations.**

***May we submit complete specifications.***

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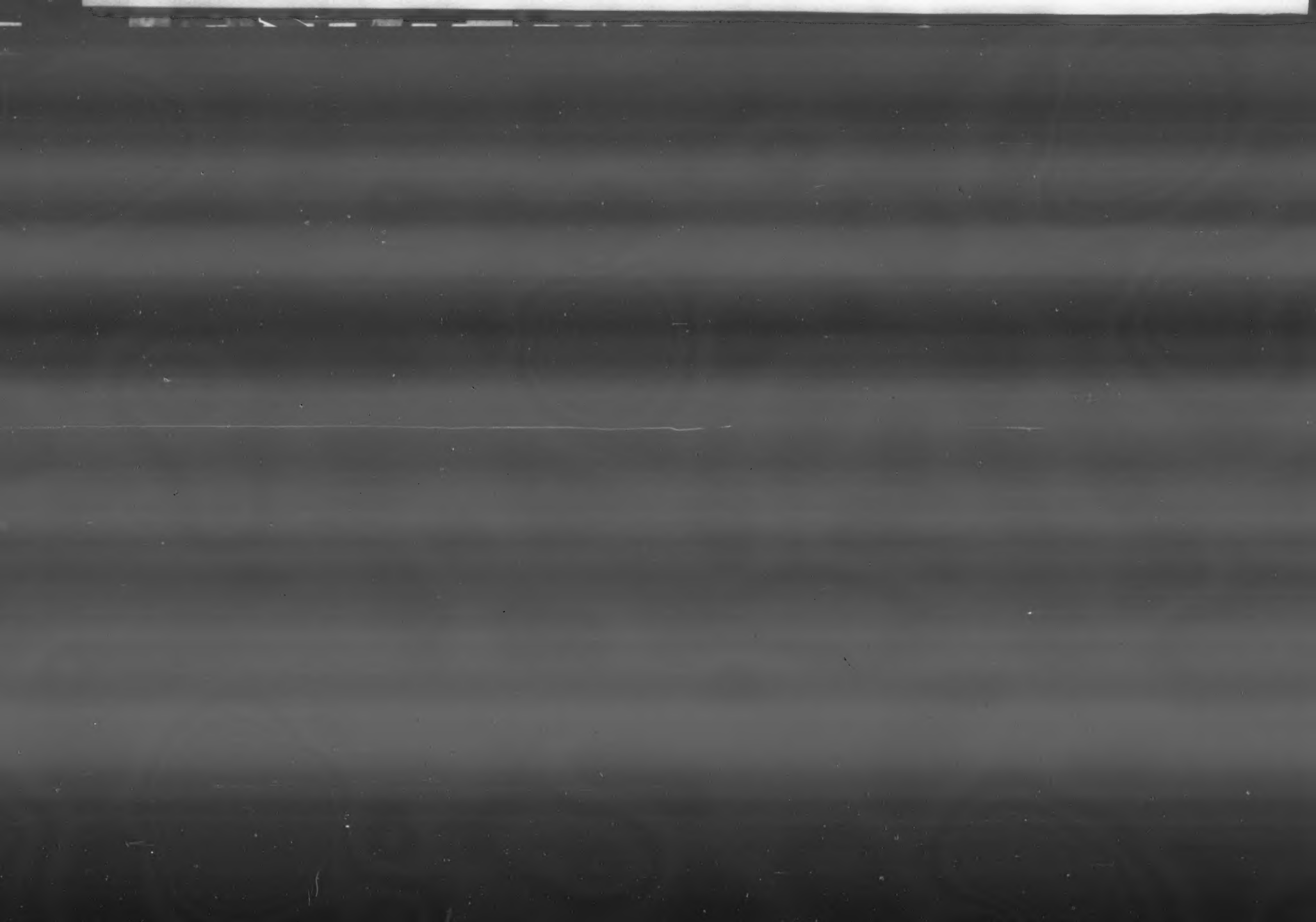


No other oxidizing agent is required. Oil solutions of organic acids on the other hand seem to attack metals like cadmium and lead only when another oxidizing agent is present. This oxidizing agent can act in a primary role in increasing the valence of the metal, (e.g. oxide formation) or in a secondary capacity in preventing polarization by free hydrogen through oxidation of the latter to water, or both.

Denison[9] has reported some work which indicates that peroxides act as oxidizing agents in the corrosion of bearing metals. He observed that a lead test strip suspended in an oil during oxidation became covered with an oxide coating in the early stages of oxidation when the peroxide content was high, but the acidity low. As oxidation proceeded, acids formed, and the oxide was dissolved. He also showed that an oil high in peroxides and low in acidity was more corrosive to cadmium-silver (in a test conducted in the absence of air) than one high in acidity but free of peroxides. A third sample which was high both in peroxide content and acidity was the most corrosive of the three. On the basis of these experiments, Denison suggests the following mechanism for corrosion in the case of highly refined oils:

$$M + AO_2 \text{ - - - - - } > AO + MO$$

$$MO + 2HA \text{ - - - - - } > MA_2 + H_2O$$

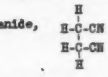
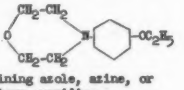
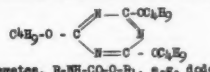
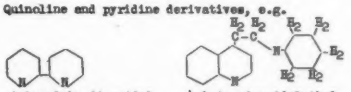
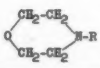
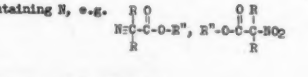
M = metal; $AO_2$ = peroxide; HA = organic acid; AO = ketone if it is assumed that $AO_2$ is a beta or higher hydroperoxide.

A recent paper by Prutton, et al[24], discusses the mechanism of the corrosion of cadmium and lead in some detail. The conclusions of these investigators are in agreement with those presented above. They found that lead and cadmium are not attacked by acids except in the presence of oxidizing agents such as molecular oxygen or peroxides. In the absence of acids, peroxides were found to form an oxide film on the surface of the metal. In the presence of acids, this film dissolves. They found that organic peroxides act as the oxidizing agent at high temperatures (above 100° C.), and the molecular oxygen at low temperatures. This conclusion is quite consistent with the well-known observation that peroxides are seldom if ever found in appreciable concentration in used oils taken from engines. This is because under engine conditions the peroxides acted as oxidizing agents as fast as they were formed, and were themselves converted to other compounds. The decrease in importance of molecular oxygen with increasing temperature is probably associated with its decreasing solubility.

2. **"Sulfur" corrosion.**—Silver and copper are characterized by a very

*(Continued on page 158)*

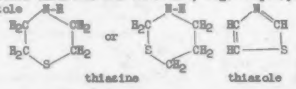
**APPENDIX 1 (CONTINUED)—SUMMARY OF COMPOUNDS CLAIMED IN U. S. PATENTS AS BEARING CORROSION INHIBITORS**

| Pat. No. & date issued | Inventor | Compound | Concentration (per cent) |
|---|---|---|---|
| | | **3. Compounds Containing Nitrogen** | |
| 2,134,306 10/25/38 | Lewis, A. W. | Beta naphtho nitrile, $C_{10}H_7CN$ | 0.2 |
| 2,139,086 12/6/38 | Lewis, A. W. | Ethylene cyanide,  | 0.2 |
| 2,139,087 12/6/38 | Lewis, A. W. | Cyanoacetamide, $N{\equiv}C\text{-}CH_2\text{-}CO\text{-}NH_2$ | 0.2 |
| 2,139,088 12/6/38 | Lewis, A. W. | Methylene amino aceto nitrile, $H_2C{=}N\text{-}CH_2\text{-}C{\equiv}N$ | 0.2 |
| 2,139,758 12/13/38 | Cook, E. W. | p-Ethoxy phenyl morpholine  | 0.2 |
| 2,160,293 5/30/39 | Shoemaker, B. H., and Loane, C. M. | Heterocyclic compounds containing azole, azine, or pyrrole groups, e.g. tributoxy cyanidine  | 0.2 |
| 2,161,615 6/6/39 | Dietrich, M. A. | Carbamates, $R\text{-}NH\text{-}CO\text{-}O\text{-}R_1$, e.g. dodecyl carbamate, N-naphthyl ethyl carbamate | 1.0 |
| 2,167,273 7/25/39 | Cook, E. W. | Diaryl amines, e.g. alpha beta dinaphthyl amine, $(C_{10}H_7)\text{-}NH\text{-}(C_{10}H_7)$ | 0.2 |
| 2,168,674 8/8/39 | Loane, C. M., and Shoemaker, B. H. | Organic cyanides, cyanates, isocyanides, and isocyanates, e.g. octyl isocyanate, $C_8H_{17}NCO$; alpha naphthyl nitrile, $C_{10}H_7CN$ | 0.01-0.75 |
| 2,187,353 1/16/40 | Lewis, A. W. | Tolylene diamines, $C_6H_3(NH_2)_2CH_3$ | 0.2 |
| 2,198,961 4/30/40 | Dietrich, M. A. | Quinoline and pyridine derivatives, e.g.  alpha alpha dipyridyl; 4-beta-piperidylethyl quinoline | 0.25 |
| 2,209,464 7/30/40 | Loane, C. M., and Shoemaker, B. H. | Urea derivatives, $O{=}C{<}^{NHR_1R_2}_{NR_3R_4}$, e.g. diethyl diphenyl urea | 0.05-0.2 |
| 2,215,591 9/24/40 | Nelson, J. F. | Substituted cyanamides, $X{=}N\text{-}CN$, where X = one divalent or two mono valent organic radicals, e.g. dibutyl cyanamide, $(C_4H_9)_2\ N\text{-}CN$ | 0.25 |
| 2,218,917 10/22/40 | Lewis, A. W. | Diamino polyaryl methane, e.g. p,p' diamino triphenylmethane | 0.2 |
| 2,220,487 11/5/40 | Lewis, A. W. | Diamino diphenylamines, e.g. 2,4'-diamino diphenylamine | 0.2 |
| 2,223,411 12/3/40 | Fuller, E. W., and Hamilton, L. A. | Reaction product of formaldehyde and N substituted aryl amine, e.g. N methyl phenylamine | 0.05-0.1 |
| 2,226,427 12/24/40 | George, R. S., and Badertscher, D. E. | Glycoximes, e.g. $CH_3\text{-}C(=N\text{-}OH)\text{-}C(=N\text{-}OH)\text{-}C_4H_9$ nickelous methyl n-butyl glycoxime | 0.25 |
| 2,239,752 4/29/41 | Lewis, A. W. | Benzo nitrile, $C_6H_5CN$ | 0.2 |
| 2,239,841 4/29/41 | Cook, E. W. | Morpholine derivatives, where R = p-ethoxy phenyl, naphthyl, etc.  | 0.05-0.2 |
| 2,270,113 1/13/42 | Clayton, J. O., and Farrington, B. B. | Esters containing amino group, e.g. octyl ester of beta amino propionic acid | 0.1-1.0 |
| 2,270,577 1/20/42 | Bergstrom, R. B., and Phillips, E. E. | Phenyl alpha naphthylamine, diphenylamine | 0.25-1.0 |
| 2,271,940 2/3/42 | James, W. H., and Fuller, E. W. | Reaction product of trinitrated benzene, toluene, cresol, etc., and naphthylamine, or substituted naphthylamine, e.g. T.N.T. + phenyl alpha naphthylamine | 0.05-0.1 |
| 2,273,862 2/24/42 | Hamilton, L. A., and Fuller, E. W. | N phenyl phenylenediamines, e.g. N phenyl p-phenylenediamine | <0.25 |
| 2,281,521 4/28/42 | Fuller, E. W. | p-Nitroso dialkyl aniline, e.g. p-nitroso diethyl aniline | <0.25 |
| 2,320,241 5/25/43 | Jenkins, V. N. | Salts of amino acids capable of forming lactims or lactamides | 0.5-1.0 |
| 2,321,578 6/15/43 | Clayton, J. O., and Farrington, B. B. | Esters containing N, e.g.  | 0.1-1.0 |
| 2,322,184 6/15/43 | White, E. R. | Semicarbazones, $R_1R_2C{=}N\text{-}NR_3\text{-}CO\text{-}NH_2$ | 1.0 |
| 2,326,938 8/17/43 | Fuller, E. W., and Hamilton, L. A. | p-Nitroso monoalkyl aniline, e.g. p-nitroso N-ethyl, butyl, or amyl, aniline | 0.25 |
| 2,337,478 12/21/43 | Lincoln, B. H., and Byrkit, C. D. | Arsen-aniline ethers, $C_6H_4NH\text{-}As\text{-}(OR)_2$, where R may be methyl, cresyl, etc. | 0.2 |
| 2,353,491 7/11/44 | Oberright, E. A. | Reaction product of aldehyde, e.g. $CH_2O$, and aliphatic polyamine, e.g. ethylene diamine, and with substituted phenol. The product is then neutralized with metal oxide, e.g. BaO | 0.2-1.0 |
| 2,354,252 7/25/44 | Fraser, H. M., and Maxwell, T. A. | Primary phenylene diamine | |

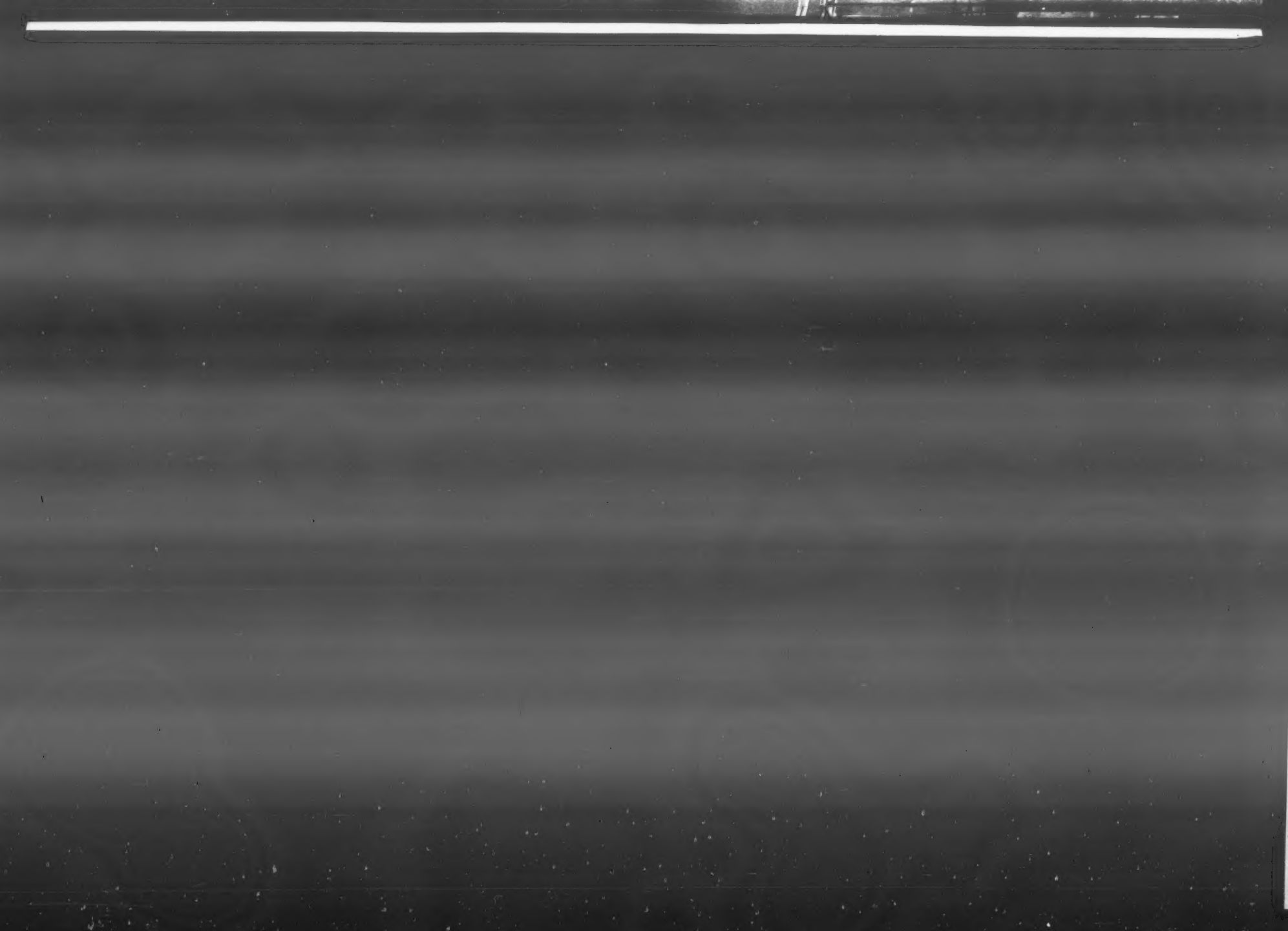
*(Continued on Next Page)*

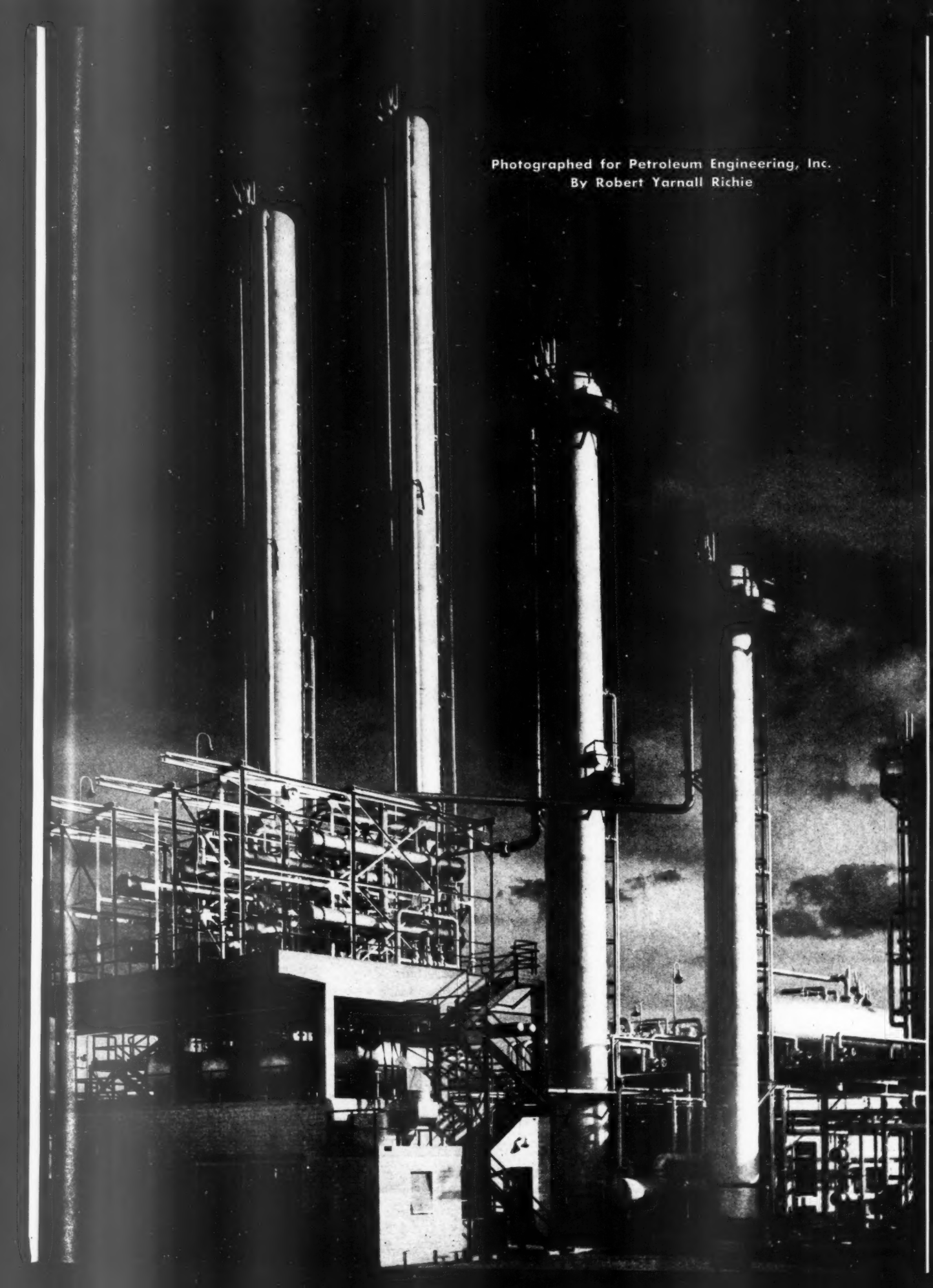
## APPENDIX 1 (CONTINUED)—SUMMARY OF COMPOUNDS CLAIMED IN U. S. PATENTS AS BEARING CORROSION INHIBITORS

| Pat. No. & date issued | Inventor | Compound | Concentration (per cent) |
|---|---|---|---|
| | | **4. Compounds Containing Phosphorus** | |
| 2,038,342 10/20/36 | Moran, R. C., Evers, W. L., and Fuller, E. W. | Triphenyl phosphite, $(C_6H_5\text{-}O\text{-})_3P$ | 0.25-0.5 |
| 2,038,343 10/20/36 | Moran, R.C., Evers, W.L., and Fuller, E.W. | Aryl phosphites, e.g. triphenyl, tri o-cresyl | 0.1-1.0 |
| 2,038,344 10/20/36 | Moran, R.C., Evers, W.L., and Fuller, E.W. | Tricresyl phosphite, $(CH_3\text{-}C_6H_4\text{-}O\text{-})_3P$ | 0.1-0.5 |
| 2,084,343 6/15/37 | Shoemaker, B. H. | Alkyl phosphites, e.g. butyl, amyl | 0.025-0.125 |
| 2,101,632 12/7/37 | Weinrich, W. W. | Tributyl phosphite | 0.1 |
| 2,167,867 8/1/39 | Benning, A. F. | Tricresyl phosphate; mono and di phosphate of C8 and $C_{10}$ n-alcohols $R_1\text{-}O$ / $R_2\text{-}O\text{-}P=O$ / $R_3\text{-}O$ where R is H or hydrocarbon group | 1.0 |
| 2,169,185 8/8/39 | Shoemaker, B. H., and Loane, C. M. | Chloralkyl phosphites, $(RO)_3P$, $(RO)_2POH$, $ROP(OH)_2$, where R is chloralkyl group, e.g. tri beta-chloropropyl phosphite | 0.25 |
| 2,174,019 9/26/39 | Sullivan, F. W. | Phosphinous and phosphinic acid esters, $R_a\text{-}P\text{-}(XR)_b$, $R_a\text{-}\underset{\underset{Z}{\|}}{P}\text{-}(XR)_b$, where Z and X are O, S, or Se, and a / b=3 e.g. diethyl phenyl phosphinate; ethyl diphenyl phosphinite | 0.0005 to 0.01 g mol per 100 g oil |
| 2,178,610 11/7/39 | Salzberg, P. L. | Naphthenyl phosphites | 0.5 |
| 2,200,712 5/14/40 | Carswell, T. S. | Aryl phosphites, e.g. tri benzyl substituted phenyl phosphites | |
| 2,202,128 5/28/40 | Torrone, C.C., and Mayer, W. H. | Phosphoric acid, at least 94% | 0.2 |
| 2,226,336 12/24/40 | Cantrell, T. L., and Turner, J. O. | Reaction product substituted phenol / $PCl_3$ | 0.25-2.0 |
| 2,226,543 12/31/40 | Ashburn, H. V., Conary, R. E., and Stutsman, P. S. | Tri cyclohexyl phosphite | 0.25 |
| 2,246,059 6/17/41 | Moran, R. C., Evers, W. L., and Fuller, E. W. | Triaryl phosphites made from substituted phenols, e.g. wax phenols, and $PCl_3$ | 0.5 |
| 2,252,674 8/12/41 | Prutton, C. F. | Reaction product $PCl_3$ and Penn. bright stock or neutral | 1.0 |
| 2,252,675 8/12/41 | Prutton, C. F., Smith, A. K., and Frey, D. R. | Reaction product $PCl_3$ / methyl lactate or other hydroxy ester | 0.03-0.06 |
| 2,253,227 8/19/41 | Cantrell, T. L., and Turner, J. O. | Reaction product substituted olefin / $PCl_3$ | 0.5-1.0 |
| 2,259,452 10/21/41 | Berger, H. G., James, W. H., and Badertscher, D. E. | Aromatic o-phosphito carboxylic acid chloride and reaction products with alcohols, amines, mercaptans, etc. | 0.1-0.25 |
| 2,260,303 10/28/41 | Engelke, E. F. | Organic chlorophosphine oxides with Cl attached to P, e.g. $(C_6H_5\text{-}O)_2\text{-}\underset{\underset{Cl}{\|}}{P}=O$ diphenoxy chlorophosphine oxide | 1.0-1.5 |
| 2,274,302 2/24/42 | Mulit, L. H. | Salt of organic substituted phosphorus acid, e.g. Ca cetyl phosphate | 0.25 |
| 2,280,450 4/21/42 | Reuter, R. | Reaction product tricresyl phosphite / octyl phenoxy ethanol | 0.4 |
| 2,310,175 2/2/43 | Farrington, B. B., Clayton, J. O., and Rutherford, J. T. | Phosphorus compounds, e.g. calcium cetyl phosphate | 0.25-0.50 |
| 2,321,307 6/8/43 | Mikeska, L. A., and Lieber, E. | Compounds of type $(R\text{-}T)_3P$, where T = Se or Te | 0.1 |
| 2,321,576 6/15/43 | Clayton, J. O., and Farrington, B. B. | Esters containing trivalent P, e.g. $R\text{-}\underset{\underset{-P-}{\|}}{CH}\text{-}CO\text{-}O\text{-}R_1$; $R\text{-}CO\text{-}O\text{-}\underset{\underset{-P-}{\|}}{CH_2}\text{-}CH\text{-}R_1$ | 0.5-2.0 |
| 2,321,804 6/15/43 | Farrington, B. B. Clayton, J. O., and Rutherford, J. T. | Salts of organic phosphoric acids, e.g. calcium, tin, cetyl phosphates | 0.25 |
| | | **5. Compounds Containing Both Sulfur and Nitrogen** | |
| 2,134,432 10/25/38 | Cantrell, T. L., and Turner, J. O. | o-Nitro phenyl thio ethers, $NO_2\text{-}C_6H_4\text{-}S\text{-}R$, where R may be ethyl, amyl, etc. | 0.05-1.0 |
| 2,134,433 10/25/38 | Cantrell, T. L., and Turner, J. O. | o-Amino phenyl thio ethers, $NH_2\text{-}C_6H_4\text{-}S\text{-}R$, where R may be ethyl, amyl, etc. | 0.05-1.0 |
| 2,139,335 12/6/38 | Shoemaker, B. H. | Thiocyano ethers and thio ethers, $R\text{-}\underset{\underset{Y}{\|}}{CH}\text{-}X\text{-}R'$, where X is O or S, and Y is -CNS or -NCS, e.g. amyl thiocyano methyl ether; amyl isothiocyano butyl thioether | 0.2 |
| 2,139,758 12/13/38 | Lewis, A. W. | Thiobenzanilide, $C_6H_5\text{-}\underset{\underset{S}{\|}}{C}\text{-}N\text{-}C_6H_5$ / H | 0.2 |
| 2,154,096 4/11/39 | Loane, C. M. | Substituted thiazines and thiazoles, e.g. triphenyl thiazole | 0.05-0.75 |




View of the Shell Oil Company cycling plant at Sheridan, Texas . . . one of the numerous gas processing plants designed and constructed by Petroleum Engineering, Inc., during its 16 years service to the industry. PETROLEUM ENGINEERING, INC. Offices: Houston and Tulsa.





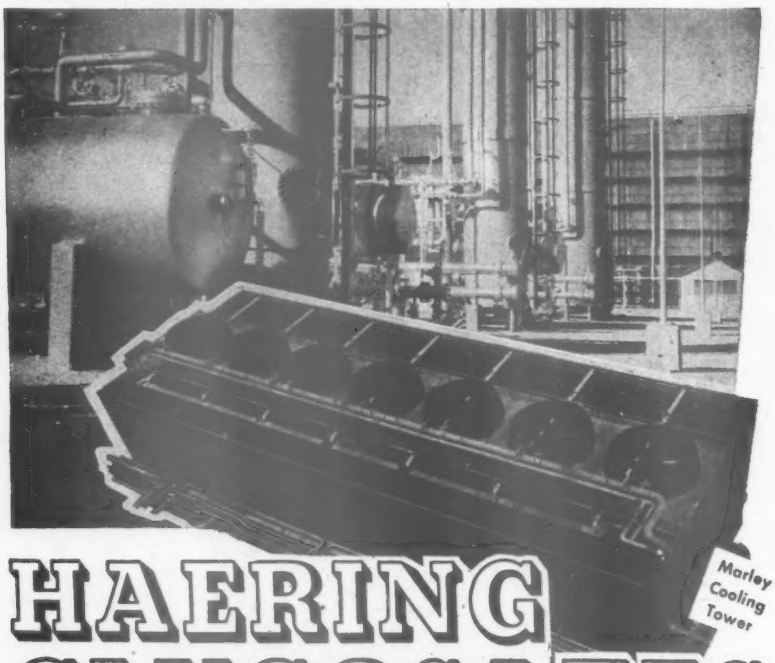
Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

strong affinity for sulfur as indicated by the solubility product constants of $Ag_2S$ and CuS in water of only $1.6 \times 10^{-49}$ and $8.5 \times 10^{-45}$, respectively. The sulfides of most metals are considerably more soluble than this. In view of the strong attraction between sulfur and the two above-mentioned metals, it is not surprising that sulfur corrosion of bearing metals is most serious in silver bearings and in the copper matrix of copper-lead. Corrosion of this type seems to be serious only under conditions of high temperature. The mechanism may be the formation first of a complex of bearing metal, e.g. copper, with a sulfur compound, which forms a passivating film on the bearing surface and is beneficial as long as it remains in that form. Under conditions of high temperature, however, the complex decomposes to form copper sulfide, which is hard and brittle, and which flakes off. This results in a loss of copper from the bearing, and may also lead to mechanical difficulty due to abrasion by the sulfide particles. Support for this theory is found in the behavior of the mercaptans occurring in raw transformer oil. These react readily with cuprous oxide to form cuprous mercaptide, which in turn decomposes to a molecule each of cuprous sulfide, mercaptan, and olefin. The mercaptan then reacts further with cuprous oxide, until ultimately all of the mercaptan sulfur is converted to a cuprous sulfide. The reaction rate is determined largely by the temperature. With a transformer oil containing approximately 0.1 per cent mercaptan sulfur, more than 10 hours was required to sweeten the oil at 400° F., but only 0.6 hours at 500° F.[28] von Fuchs[28] showed that the copper mercaptides of mercaptans occurring in gasoline decompose at temperatures above 350° F. Thus the temperatures occurring at a bearing surface may promote the reactions postulated above.

3. **Corrosion by aqueous acids.**—This type of corrosion is like Type 2 in that copper is preferentially dissolved. It is not covered to any appreciable extent in the literature, but appears to be increasing in importance. Geniessee[14] has commented upon it, and associates it with low temperatures and insufficient venting. Similar comments are made in a bearing manual issued by Clawson and Bals[7], who attribute the preferential solution of copper to the presence of "fuel acids." These fuel acids may be organic acids of low molecular weight or sulfuric and sulfurous acid originating from sulfur in the gasoline. Since lead sulfite and sulfate are insoluble, it is quite conceivable that the latter acids would, in the presence of oxidizing agents, dissolve copper preferentially.

The mechanism of this type of corrosion is probably fundamentally similar to that of Type 1, the only major difference being the nature of the diluent.

Note: References for the entire series will appear with the third and final installment.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# BOOKS

STANDARD METHODS OF ANALYSIS OF IRON, STEEL, AND FERRO-ALLOYS. The United Steel Companies, Ltd., 17 Westbourne Road, Sheffield, England. 93 pp. 7s 6d.

Two previous editions of this book have appeared in 1933 and 1936. In presenting this third edition, advantage has been taken of the progress made in chemical methods of analysis during the past few years, to bring the text completely up to date. The work is confined to standard methods of chemical procedure and does not attempt to cover the developments in technique which have been made with the application to ferrous analysis of physical methods such as the absorptiometer, the spectrograph, and the polarograph. The methods detailed are those in use in the laboratories of the constituent branches of United Steel Companies, Ltd.

SYMPOSIUM ON MAGNETIC PARTICLE TESTING. Published by American Society of Testing Materials, 260 South Broad Street, Philadelphia. 130 pp. $1.25.

Comprising eight technical papers with considerable discussion, as presented at a meeting of the Philadelphia district, A.S.T.M., this publication covers the application of this widely used test in a number of industries.

# How to Inject Gas Into Limestone-Dolomite Reservoirs

*by John A. Barnett* and Merwin H. Soyster**

**HOW gas-injection operations should be conducted in limestone-dolomite formations is a prime problem in current petroleum engineering technology, due to variations in pays and the multizone conditions usually present. The essential features of a report, "Engineering Report on Grayburg Cooperative and Unit Area," prepared to assist the Grayburg Unit Association in determining the proper locations of gas-injection wells and the best methods for future operation are given here. The 4,769 acres covered by federal oil and gas leases were committed to the Grayburg cooperative and unit agreement by the Interior Department on October 5, 1943. The Grayburg Unit Association has been formed and designated to conduct and manage all operations in the unit area.**

FIRST oil production in the Grayburg unit area, located in northeastern Eddy County, New Mexico, was obtained in 1929 by Grayburg Oil Co. in 2-A Burch, 19-17s-30e. This well was drilled to a total depth of 3,142 ft. and completed for an initial production of 50 bbl. of 36.3° A.P.I. gravity oil per day. Drilling was conducted sporadically up to August 1937, only eight wells being completed. However, by December 31, 1943, there were 46 producing oil wells within the unit area.

Production has ranged from the unrestricted yield of earlier wells to a maximum daily allowable of less than 30 bbl. per well, and more recently has been at a maximum daily well allowable of 48 bbl.

### Stratigraphy and Structure

Surface of the unit area consists largely of small shifting sand hills, which preclude a determination of surface structure by examination of outcrops. The stratigraphy consequently has been determined by a study and correlation of samples of formations drilled, together with the correlation of electrical logs. Nomenclature, correlations, and formation intervals used in this report are based on studies of Southeast New Mexico and West Texas by Dickey,[1] King,[2] and others.[3]

Formations below the Salado or "salt section" (400 to 500 ft. thick) are shown in detail on cross-section. It will be noted that a system of numbers for the producing zones in the San Andres formation is shown. This is in conformity with a system originated in many other southeastern New Mexico fields by the Roswell office of the Oil and Gas Leasing Division, Conservation Branch, Geological Survey,[4] and now commonly used by many New Mexico operators, geologists, and engineers.

As most of the oil found in the unitized area occurs in the San Andres formation, there are indicated on the cross-section only the correlations of Zones 7, 8, 9, and 10, which are the zones known to produce oil in the San Andres. Only four wells in the area produce oil from the Grayburg formation—two from Zone 5 and two from Zone 6.

*Petroleum engineer, U. S. Geological Survey, Roswell, N. M., office.

Below the eighth zone correlations are made almost entirely on the occurrence of oil pays rather than on stratigraphy or lithology. Particularly in the western portion of the unit area, Zones 9 and 10 are closely related and somewhat difficult to correlate, and for production and engineering purposes might properly be considered as one zone.

There is no evidence of faulting. It is quite probable that, although structure has been a general factor influencing the accumulation of oil, the very irregular nature of the accumulations of oil is due to variations in permeability and cementation of the reservoir rock, and to minor structural flexures that serve as barriers or stratigraphic traps.

### Reservoir Conditions

Productive zones, consisting of porous dolomite in the San Andres formation, are relatively thin. Several wells have thus far produced in excess of 150,000 bbl. of oil, and some in excess of 350,000 bbl. On the other hand, some wells in the area will probably not yield 50,000 bbl. ultimately. This is indicative of the wide range in porosity and permeability of the producing zones.

It is ordinarily necessary to shoot the formations above the San Andres, where found productive, in order to establish commercial production. It is likewise necessary to acidize under pressure the producing zones encountered in the San Andres formation, in most wells. A few wells have been drilled that require neither shooting nor acidizing.

The production of water with the oil in the unit area has never been a problem. Estimates based on neighboring fields where determinations have been made, indicate a probability of 15 to 30 per cent connate water. There is no evidence of either a direct or an indirect water drive in the area.

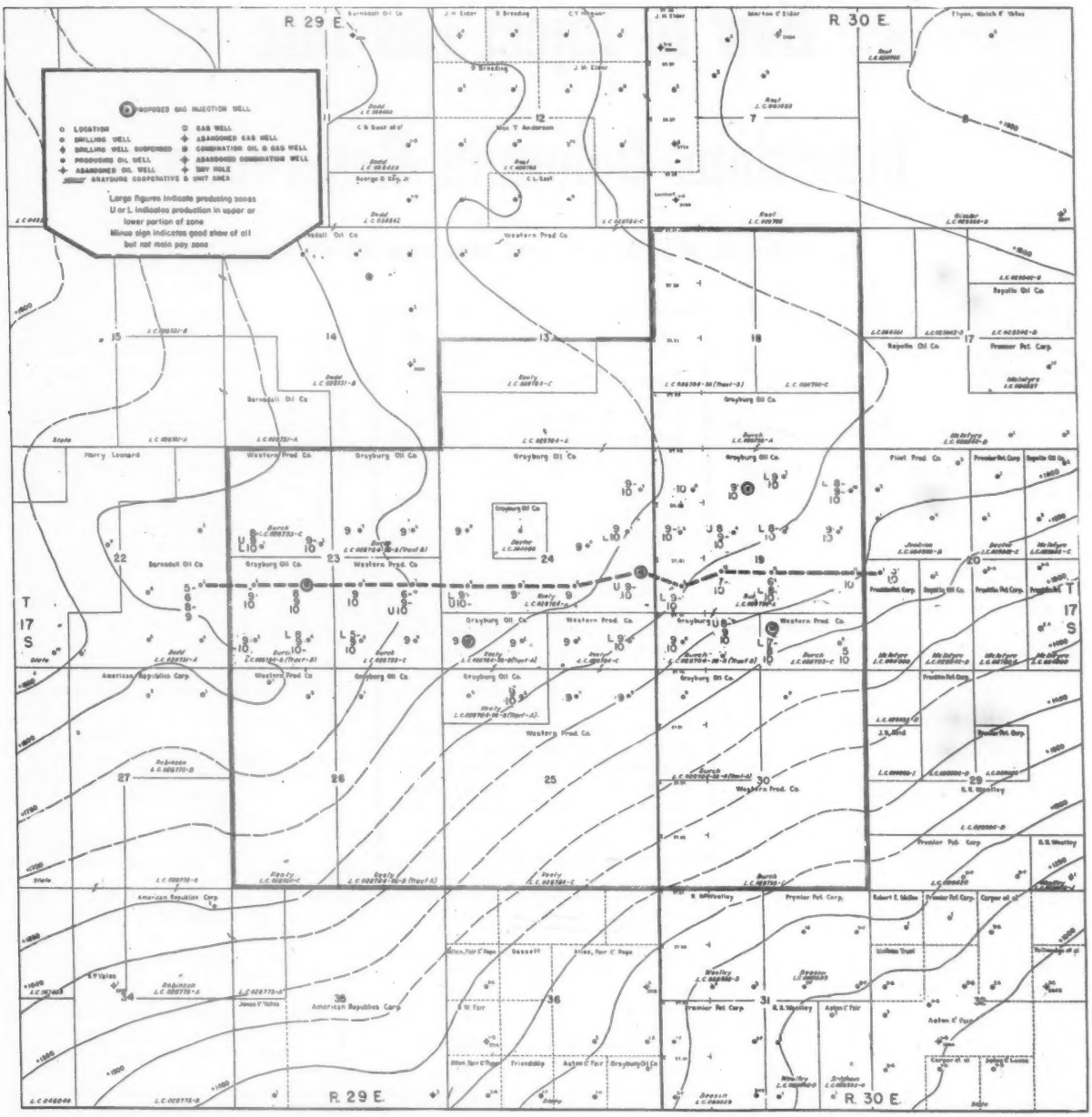
### Drilling and Production Methods

All wells in the unit area have been drilled with cable-tool drilling equipment, usually portable machines. The average cost of drilling and completing a well for production is approximately $15,000.

The usual drilling program provides for a string of 10¾ or 8⅝-in. casing set in the anhydrite immediately above the top of the Salado or "salt section" at depths ranging from 300 to 500 ft., and cemented with 50 sacks of cement, preceded by mud circulated to the surface. This serves as an "anchor string," and affords protection to the potash-bearing salt beds from infiltration of upper waters. It also affords protection against caving of the upper strata. A string of 7 or 5½-in. casing is then set at a point approximately 100 ft. above the first producing zone, and cemented with 100 sacks of cement, preceded by mud circulated to the surface.

Although wells are sometimes swabbed into production and completed naturally, it is usually necessary to stimulate production by acidizing the dolomite pay zones under pressure, in order to obtain production in commercial quantities. The oil is generally produced through 2-in. tubing, set about 20 or 30 ft. above the pay zone.

All wells in the unit area are flowing except Grayburg Oil Co. 9-A Burch, which is being pumped. The oil is usually produced intermittently through surface chokes on the tubing, in order to conserve gas. No bottom-hole chokes have been used, although it is contemplated that such practice


R. 29 E.
R. 30 E.
PROPOSED GAS INJECTION WELL
LOCATION
DRILLING WELL
DRILLING WELL SUSPENDED
PRODUCING OIL WELL
ABANDONED OIL WELL
GAS WELL
ABANDONED GAS WELL
COMBINATION OIL & GAS WELL
ABANDONED COMBINATION WELL
DRY HOLE
GRAYBURG COOPERATIVE & UNIT AREA
Large figures indicate producing zones
U or L indicates production in upper or lower portion of zone
Minus sign indicates good show of oil but not main pay zone
T 17 S
R. 29 E.
R. 30 E.

***The Grayburg unitized area, where gas-injection equipment is now being installed, covers 4,769 acres. Each well has been carefully "zoned" as to its different productive horizons, so that injection wells could be selected which would be of maximum effectiveness. All but one of the unit wells flow naturally***

may be resorted to in the future in order that the production may be attained without pumping equipment after bottom-hole pressures have been further reduced. Under present practices, approximately 215 psi. is the minimum pressure at which the wells will continue to flow.

The bottom-hole pressures in the unit area range from a low of 230 to a high of 1,018 psi. (December 1943). Average bottom-hole pressure has been computed as approximately 530 psi. during December 1943. For purposes of this report, low, intermediate, and high-pressure areas have been

**TABLE 1—SAMPLE FROM GRAYBURG OIL CO. 6-A KEELY, 24-17s-29e, FROM LOWER PORTION ZONES 9 AND 10**

| | | | |
|---|---|---|---|
| Specific gravity | 0.836 | A.P.I. gravity | 37.8 |
| Per cent sulfur | 0.90 | Pour point, °F. | Below 5 |
| Salbolt Univ. Vis. at 70° F. | 43 sec. | Color | Green |
| Saybolt Univ. Vis. at 100° F. | 39 sec. | Base | Intermediate |

**Approximate Summary of Distillation by Bureau of Mines, Hempel Method**

| | Per cent | A.P.I., 60° F. | Viscosity, sec. |
|---|---|---|---|
| Light gasoline | 14.1 | 70.9 | ..... |
| Total gasoline and naphtha | 38.4 | 56.2 | ..... |
| Kerosene distillate | 5.3 | 42.6 | ..... |
| Gas oil | 16.4 | 35.6 | Below 50 |
| Nonviscous lubricating distillate | 9.8 | 28.2 | 50-100 |
| Medium lubricating distillates | 6.4 | 24.8 | 100-200 |
| Viscous lubricating distillate | | | Above 200 |
| Residuum | 20.3 | 16.2 | ..... |
| Distillation loss | 3.4 | ... | ..... |

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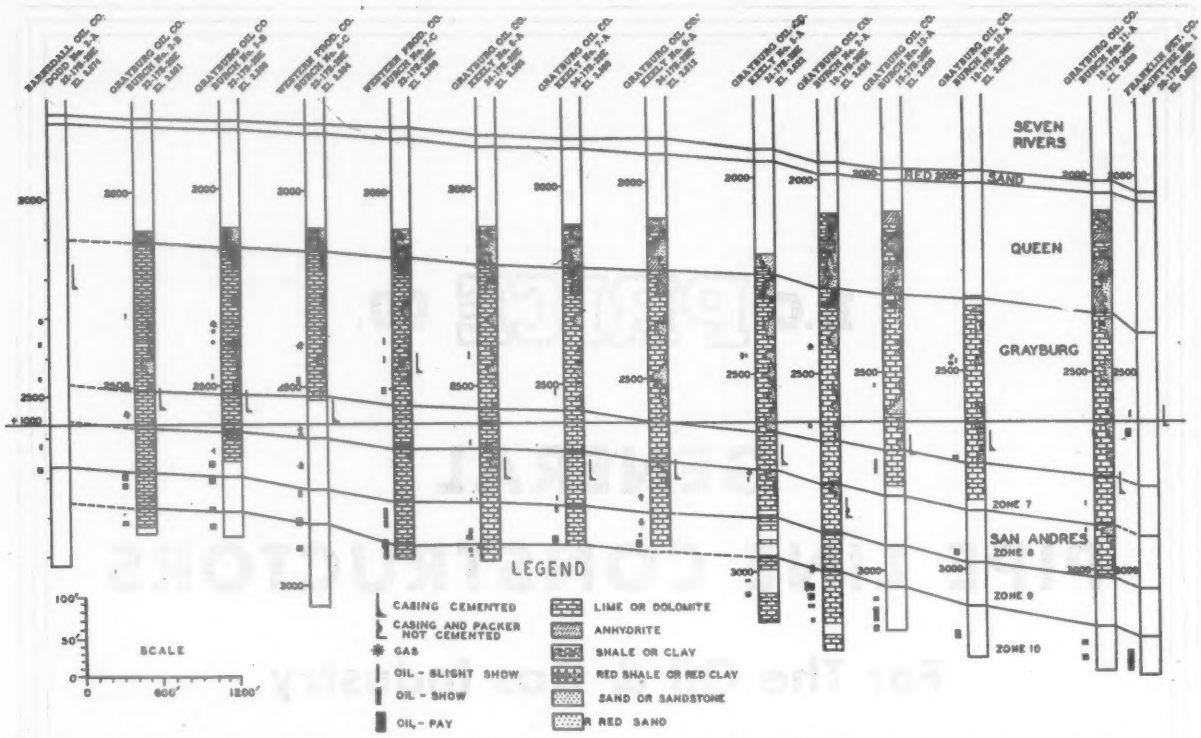



*West-to-east cross-section through center of Grayburg unitized area. Exact course of profile is shown on map. In "zoning" the 46 wells to lay out the program, three different cross-sections through the area were constructed*

designated. The low-pressure area includes all wells with bottom-hole pressures of less than 400 lb. and the high-pressure area includes all wells with more than 700 lb.

### Production Data

To January 1, 1944, a total of 2,766,150 bbl. of oil had been produced from 1,920 acres of proved oil land in the unit area, which represents an average recovery of approximately 1,440 bbl. per acre. However, most of the wells in the area have been drilled in recent years, and one well that has been producing for almost 10 years has yielded more than 11,000 bbl. per acre and still produces more than 40 bbl. of oil per day.

For 46 producing wells in the unit, average initial production has been 183.3 bbl. per day, and the average cumulative production to January 1, 1944, 60,134 bbl. Production of 13 of the wells has been restricted (December 1943) to 46.1 bbl. per day by proration; the other 33 wells averaged 21.9 bbl. per day.

### Oil Analyses

The analyses shown in Table 1 were made by the U. S. Geological Survey at Casper, Wyo.

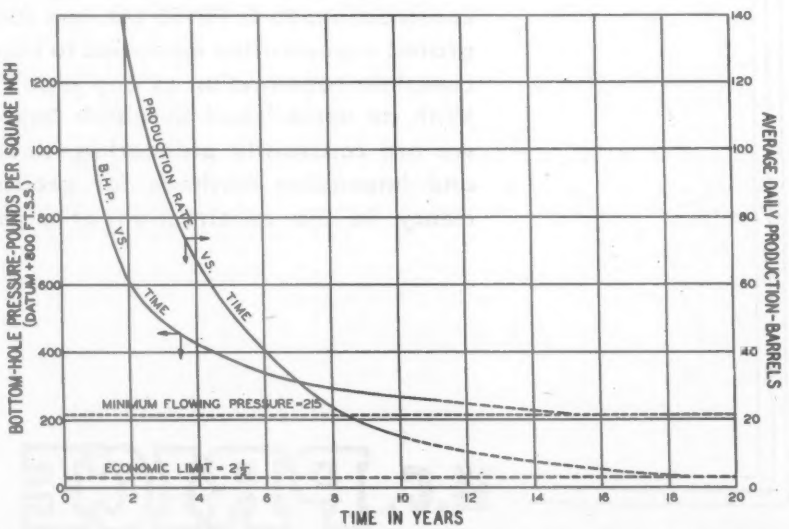
### Gas-Oil Ratios

Gas-oil ratios in the unit area range from 500 to 4,300 cu. ft. of gas per barrel of oil. During January 1944 on test, the total gas volume from the unit area averaged 1,354,000 cu. ft. with an average production of 1,425 bbl. of oil per day, and a gas-oil ratio for the unit of 947 cu. ft. per barrel.

### Pressure-Maintenance Program

The Grayburg Unit Association contemplates the initial injection of about 1 million cubic feet of available casinghead gas per day recovered from the producing oil wells in the unit area. For this purpose there have been installed three compressors with a total of 350 hp. and a capacity of 1,250,000 cu. ft. of gas operating under 20-lb. intake pressure and 800-lb. discharge pressure. Initial injection pressures are not expected to exceed 700 psi.

Determination of wells most suitable for gas injection is a matter of




*To serve as "gages" of the future gas-injection performance, the two curves above, representing average conditions for the unit area up to the present time, have been constructed. After gas injection, it is expected that both curves will assume new slopes, and the differences between the new and old will represent the benefits derived*

prime importance in the inception of any pressure-maintenance program. With the volume of gas available and the number of producing wells in the unit area it was determined that five oil wells could reasonably be converted into input wells to give maximum recovery of oil for the amount of gas used. It will undoubtedly be necessary to use additional input wells as more oil wells are completed and more gas becomes available for injection within the unit area.

### How the Gas Input Wells Were Selected

Criteria for determination of gas input wells include such factors as structure, bottom-hole pressures, gas-oil ratios, lithology, permeability, and other characteristics of the producing formation. Thorough study and detailed correlations were made of sample, electric, and drillers' logs, as well as all other available data obtained of the area, before the five selected. The zones from which the wells are producing oil were considered, it being the object to centralize each injection well in a group of wells in the same zone or zones. As stated before, practically all the oil produced in the unit area is obtained from Zones 9 and 10 and consideration was given to the injection of gas into those two zones only, so that the gas would not be dissipated into barren zones or upper zones of porosity or sands that could act in some instances as "thief sands" as indicated by electric-pilot surveys. To insure this further, it is planned to inject gas through tubing with packers set in the injection wells immediately above Zone 9.

Four of the five injection wells selected are located between low-pressure areas that have been producing for some time, and high-pressure areas recently drilled. It is anticipated that this will serve to retard the rate of decline in high-pressure areas and at the same time build up or repressure the low-pressure areas, thereby materially benefiting the recovery of oil in the entire unit area.

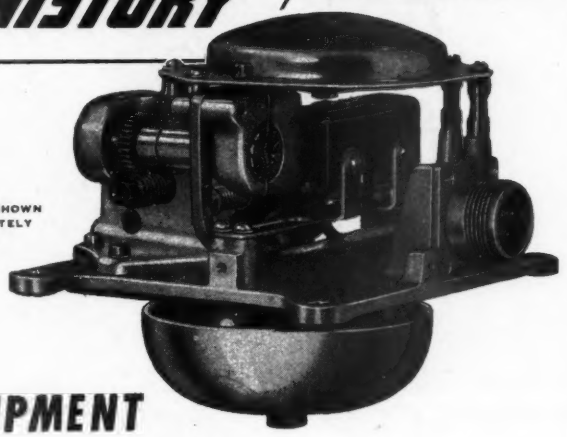
It is intended that the average field gas-oil ratio shall be maintained below 2,000 cu. ft. per barrel, and that where ratios become excessive the oil production will be adjusted, remedial work done, or the offending wells shut in to conserve gas and maintain reservoir energy.

### Estimates of Future Production

Success of a pressure-maintenance project is measured by the amount of oil recovered after gas injection as compared with a reasonable estimate of the amount of oil that would have been recovered without the return of gas to the producing formations.

Two decline curves have been prepared, that should aid in evaluating this increased production at a later date, namely, a bottom-hole pressure-


CASE HISTORY

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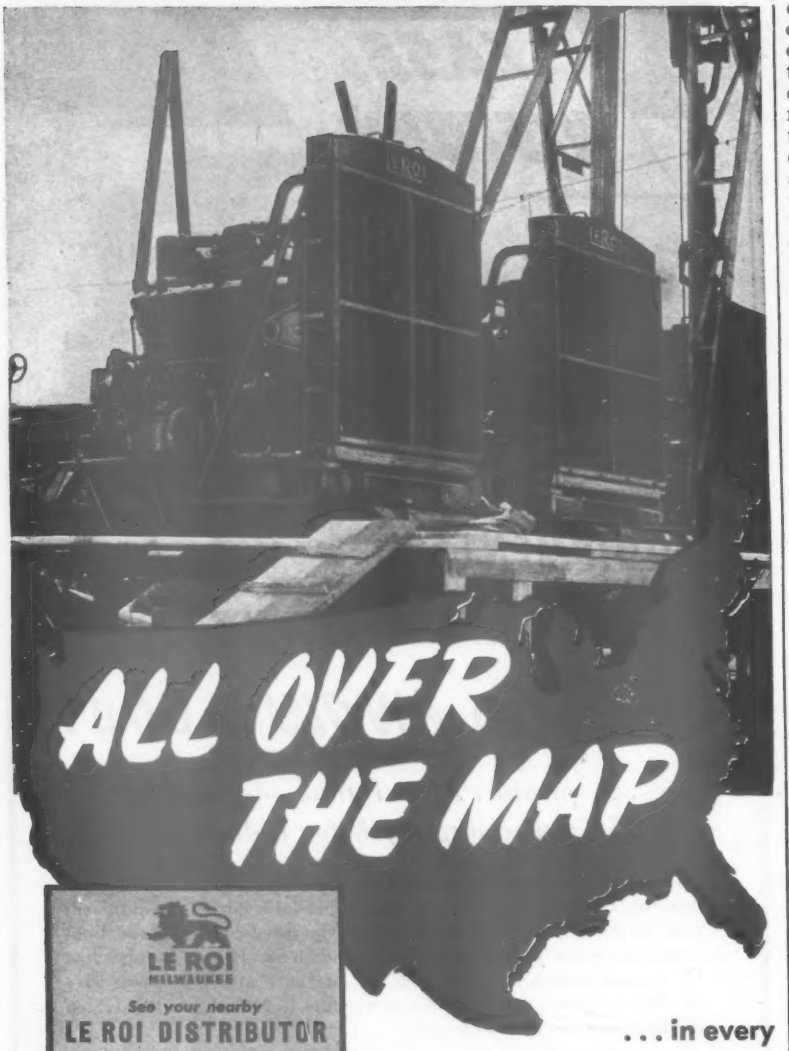


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decline curve and a production-decline curve. All data and varying conditions were considered in arriving at the information plotted on these curves, and it is believed that they represent average conditions for the unit area. After injection of gas, it is quite probable that both curves will assume new rates of decline. The intervals between the new curves and those that would normally be expected under primary producing methods will represent the benefits derived from the secondary-recovery project.

**TABLE 2**

**Estimated Future Production Chart for Individual Wells Based on Primary Recovery Methods and Economic Limit of 3 Bbl. of Oil Daily**

| Present daily production (bbl.) | Estimated future life (yr.-mo.) | Est. future production (bbl.) |
|---|---|---|
| 150 | 17 - 10 | 186,643 |
| 125 | 17 - 4 | 162,553 |
| 100 | 16 - 10 | 141,018 |
| 90 | 16 - 6 | 130,068 |
| 80 | 16 - 1 | 116,414 |
| 70 | 15 - 8 | 105,491 |
| 60 | 15 - 1 | 91,226 |
| 50 | 14 - 4 | 76,535 |
| 45 | 13 - 10 | 67,714 |
| 40 | 13 - 4 | 60,231 |
| 35 | 12 - 11 | 54,300 |
| 30 | 12 - 4 | 47,700 |
| 25 | 11 - 8 | 41,008 |
| 20 | 10 - 10 | 34,043 |
| 15 | 9 - 4 | 24,645 |
| 10 | 7 - 2 | 14,988 |
| 5 | 3 - 0 | 4,270 |

The tabulation in Table 2 has been prepared from the production-decline curve, and provides in readily usable form an estimate of normally expected future production. However, in using this tabulation, it is necessary that the "present daily production" be construed as the settled average daily capacity of a well over a period of several weeks rather than the flush potential as determined by a short test.

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3. The Oil and Gas Resources of New Mexico, Second Edition, New Mexico School of Mines, State Bureau of Mines and Mineral Resources, Bull. 18, 1942.

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**D. E. Curry,** Kettleman North Dome Association, has been elected chairman of the Coalinga-Kettleman chapter of A.P.I. Other new officers are **Charles Bevan,** first vice chairman; **Walter Boice,** second vice chairman, and **Earl G. Smith,** secretary-treasurer.

**Paul B. Fahle** has resigned as geologist for Pure Oil Co. at Houston to become Arkansas-Louisiana district geologist for Plymouth Oil Co.

# Classification of Petroleum Reservoirs

*by O. Wilhelm*

## I—Introduction

THE following study is based on the concept that the existence of petroleum reservoirs is due to certain sets of geological factors which cause the trapping of petroleum, and that the great variety in types of reservoirs results from the multiplicity of combinations of such trap-forming factors. It is attempted to establish and define these factors, to describe their function and interrelation, and to derive on this basis a classification that will permit a systematic discussion of petroleum reservoirs.

## II—Classification of Reservoirs

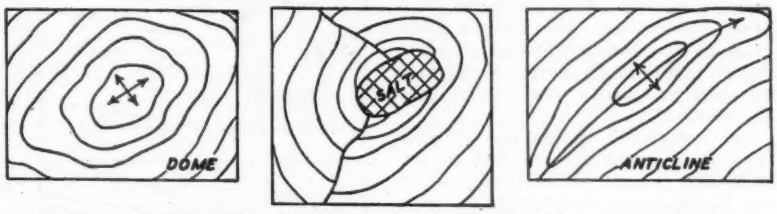
Petroleum reservoirs are mostly classified with reference to the structural and stratigraphic factors connected with the accumulation. The numerous types of reservoirs are due to the multitude of such factors and their combinations, and the search for a foundation for a systematic division has proved to be a difficult undertaking.

The system discussed in this study is based on the concept that typical traps are formed by combination of two or more of a group of geological factors which are considered to be the following.

1. Structural environment
2. Convexity in the surface of a reservoir bed which may be due to folding, differential thickness, differential porosity, or to combination of these factors
3. Loss of porosity and permeability in a reservoir bed in lateral direction, including interruption of porosity and permeability by lithologic change, for example, from sand to shale
4. Stratigraphic pinch-out of a reservoir bed
5. Structural interruption of a reservoir bed, either by faulting or by tectonic piercement

Factor 1, indicating the structural environment of a reservoir, is naturally present in every case. It expresses the structural attitude of the strata in the reservoir area, but does not refer to the reservoir bed. Factors 2 to 5, on the other hand, deal with the situation in the reservoir bed. They point out the different conditions that intercept the movement of the fluids and that are thus responsible for the different types of traps. On this basis, two kinds of reservoir indicators have been adopted by means of which a complete geological definition of any reservoir is attempted. The indicators are "Structural Environment Indicators," derived from Factor 1, and "Trap Indicators," derived from Factors 2 to 5, and described as shown on this page.

### STRUCTURAL ENVIRONMENT INDICATORS



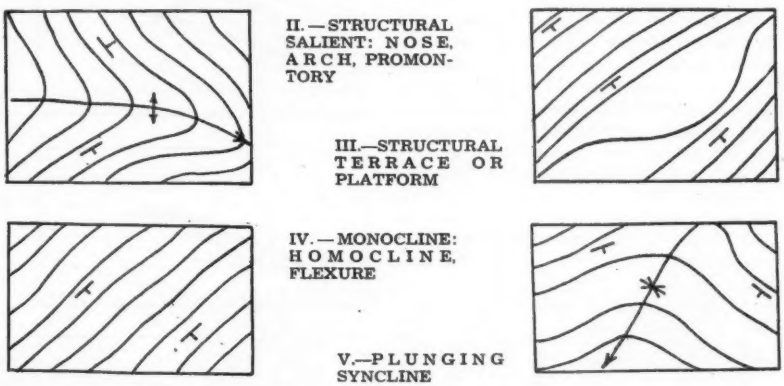

I.—DOME and ANTICLINE, representing the most important types of uplifts in oil-field structures; for classification purposes, additional distinctions are made by:

Ia.—Indicating the apex or structural center of a dome or the axial culmination of an anticline,

Is.—Designating a piercement-type salt-dome uplift, where the presence of a salt plug dominates the environment of the reservoir,

Id.—Designating a diapiric uplift, where the presence of a diapiric shale core controls the environment of the reservoir,

Ii.—Designating a volcanic uplift, where the presence of an igneous plug controls the environment of the reservoir.



II.—STRUCTURAL SALIENT: NOSE, ARCH, PROMONTORY

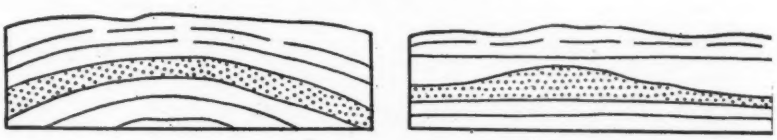
III.—STRUCTURAL TERRACE OR PLATFORM

IV.—MONOCLINE: HOMOCLINE, FLEXURE

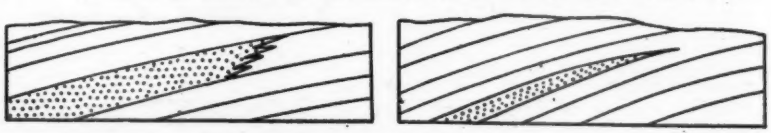
V.—PLUNGING SYNCLINE

VI.—Absence of controlling structural condition.

### TRAP INDICATORS

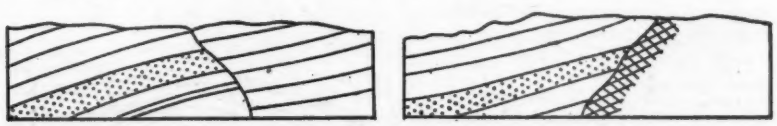


A.—CONVEX TRAP: A convex surface in an **uninterrupted** porous zone



B.—PERMEABILITY TRAP: Lateral disappearance of porosity and permeability in a porous layer

C.—PINCH-OUT TRAP: Stratigraphic wedging-out of a porous layer



F.—FAULT TRAP: Interruption by faulting on a porous layer

G.—PIERCEMENT TRAP: Interruption by tectonic piercement of a porous layer

**THE system of classification of petroleum reservoirs presented in this article was devised by Dr. O. Wilhelm of the production department of Shell Oil Co., Inc. It is an entirely new approach to the problem of classification and is derived by combining in various ways the sets of geological factors, or trap-forming factors, which cause the trapping of petroleum. Since the number of these trap-forming factors is small, the system is easily built up and may be used to classify any known type of reservoir.**

**An individual discussion of each type of reservoir as classified by Dr. Wilhelm's system will be published on the Engineering Fundamentals page of the Journal beginning in the issue of March 2, 1946.**

The logical combinations of the foregoing trap and environment indicators should define and classify the numerous types of reservoirs. A system can be established either with reference to the structural environment indicators or with reference to the trap indicators. The latter choice appears preferable and is followed in the present classification. Accordingly, reservoirs are divided into groups designated by the foregoing trap indicators. Each group can be defined most conveniently by the distinctive characteristics of the reservoir peripheries which result from the various types of traps. The reservoir groups and their distinctions are therefore the following:

GROUP A.—CONVEX TRAP RESERVOIRS which are completely surrounded by edge water as the porosity extends in all directions beyond the reservoir areas. The reservoir peripheries are therefore defined by uninterrupted edge-water limits. The trap is due to convexity alone

GROUP B.—PERMEABILITY TRAP RESERVOIRS with the periphery partly defined by edge water and partly by the barrier resulting from loss of permeability in the reservoir layer. In the extreme case a reservoir may be entirely surrounded by such a barrier

GROUP C.—PINCH-OUT TRAP RESERVOIRS with the periphery partly defined by edge water and partly by the margin due to the pinch-out of the reservoir bed

GROUP F.—FAULT TRAP RESERVOIRS with the periphery partly defined by edge water and partly by a fault boundary

GROUP G.—PIERCEMENT TRAP RESERVOIRS with the periphery partly defined by edge water and partly by a piercement contact

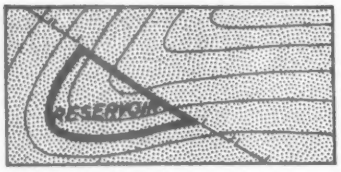
By introducing the environment indicator, each group is divided into six types, identified by the structural environment and designated by the respective environment indicators, for example, the following:

Type A-I.—Convex Trap Reservoir on dome or anticline

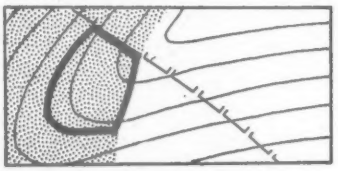
Type A-II.—Convex Trap Reservoir on structural salient (nose, arch, promontory)

Type A-III.—Convex Trap Reservoir on structural terrace or platform

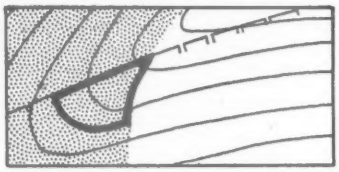
Type A-IV.—Convex Trap Reservoir on



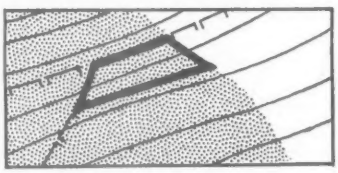
(1) F-II
A Single Fault Trap Reservoir on a structural nose. The trap is formed by a fault cutting across the axis of the nose. Both indicators are essential for this reservoir and define the reservoir completely as a single trap reservoir



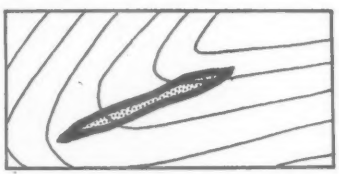
(2) F/B-II
A Modified-Fault-Trap Reservoir, essentially formed by F and II. But the reservoir is restricted by a barrier due to loss of permeability in the reservoir bed as shown by the permeability trap indicator B. However, this latter indicator is incidental as the trapping conditions are complete with F and II



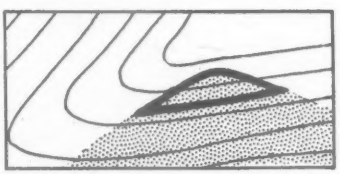
(3) F×B-II
A Double-Trap Reservoir on a structural nose where a couple of trap indicators and the environment indicator are necessary to define the trap. In this case factor B is essential as F and II alone do not complete closure



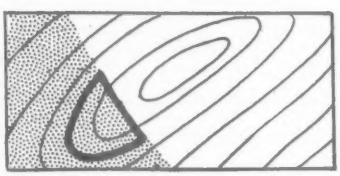
(4) F×F×B-IV
A Triple-Trap Reservoir on a monocline with three trap indicators, all of which are essential as no trap would be formed by one or two of the trap indicators only



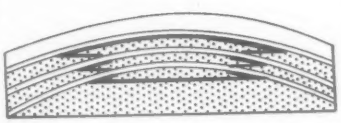
(5) B/II
A Lenticular Permeability Trap Reservoir in an isolated permeable lens located on a structural nose. The reservoir is completely surrounded by impervious formation and the environment indicator is incidental; it merely points out the nature of the structural environment in which the reservoir occurs



(6) B-IV/II
A Permeability Trap Reservoir in a monoclinal position on the flank of a structural nose. Within the restricted area of the reservoir the structural position is monoclinal and it would therefore be correct to define this reservoir by the symbol B-IV. However, to give the complete description of the structural environment, the indicator II is added as an incidental indicator



(7) B-II/I
A Permeability Trap Reservoir on the plunging axis of an anticline. Within the reservoir area the structural position is identical with that on a structural nose and the reservoir symbol B-II would be complete. The indicator I is added to give the full description of the environment



(10) m(A)-Ia
A Complex Convex Trap Reservoir, representing a productive interval which is composed of individual Simple Convex Trap Reservoir units, each with an individual edge water. This reservoir occurs in formations consisting of rapidly alternating beds of porous and tight layers, such as sand and shale

(11) m(B)-Ia
A Complex Permeability Trap Reservoir composed of separate accumulations in lenticular porous members with separate oil-water contacts for each member; some of the porous lenses may be entirely saturated and may contain no water.

## TABLE I - CLASSIFICATION OF PETROLEUM RESERVOIRS

| | Is APEX (DOME ANTICLINE | II STRUCTURAL SALIENT | III STRUCTURAL TERRACE | IV MONOCLINE | V SYNCLINE | VI ABSENCE OF STRUCTURE | Is PIERCEMENT SALT DOME | Id DIAPIRIC ANTICLINE | Ii IGNEOUS UPLIFT |
|---|---|---|---|---|---|---|---|---|---|
| **A. CONVEX TRAP RESERVOIRS** | | | | | | | | | |
| *SIMPLE CONVEX R.* | A-Is A/Ba-Is A/F-Is | A-II | A-III | A-IV | A-V | A-VI | A-Is (CAPROCK) | | |
| *COMPOSITE CONVEX R.* | A(F)-Is (A-Ba)-Is | | | | | | | | |
| *COMPLEX CONVEX R.* | m(A)-Is, m(A/F)-Is m(A/Ba)-Is | | | | | | | | |
| **B. PERMEABILITY TRAP RESERVOIRS** | | | | | | | | | |
| *FEATHER-EDGE POROSITY R.* | | Ba-II, Ba-II/I Ba/A-II | Ba-III Ba/A-III | Ba-IV, Ba-IV/I Ba/A-IV, Ba-IV/II | Ba-V Ba/A-V | | | | |
| *LENTICULAR R.* | Bb/Is | Bb/II | Bb/III | Bb/IV | Bb/V | Bb/VI | | | |
| *FRACTURE ZONE R.* | Bc-Is | | | | | | | | |
| *ASPHALT-SEALED R.* | | Bd-II Bd-II/I | | Bd-IV/I | | | | | |
| *COMPLEX PERMEABILITY TRAP R.* | m(B)-Is | | | | | | | | |
| **C. PINCHOUT TRAP RESERVOIRS** | | | | | | | | | |
| *DEPOSITIONAL PINCHOUT R.* | | Ca-II Ca-II/I | Ca-III | Ca-IV, Ca-IV/I Ca-IV/II | Ca-V | | Ca-Is, CaxF-Is CaxF-IIs | | |
| *TRUNCATED PINCHOUT R.* | | Cb-II Cb-II/I | Cb-III | Cb-IV, Cb-IV/I Cb-IV/II | Cb-V | | Cb-Is, CbxF-Is CbxFxF-Is | | |
| *OVERLAP PINCHOUT R.* | | Cc-II Cc-II/I | | Cc-IV, Cc-IV/I Cc-IV/II | | | | | |
| **F. FAULT TRAP RESERVOIRS** | | | | | | | | | |
| *FAULT SEGMENT R.* | F-Is | F-II F-II/I | F-III | F-IV | | | | | |
| *FAULT BLOCK R.* | FxF-Is | | | | | | | | |
| *FAULT WEDGE R.* | FxF-Is | FxF-II FxF-II/I | FxF-III | FxF-IV, FxF-IV/I FxF-IV/II | FxF-V | | | | |
| *DOUBLE TRAP R.* | | FxA-II, FxB-II FxC-II | FxA-III FxB-III FxC-III | FxA-IV, FxB-IV FxC-IV | FxA-V, FxB-V FxC-V | | | | |
| *TRIPLE TRAP R.* | | | | FxFxF-IV FxFxB-IV | | | | | |
| **G. PIERCEMENT TRAP RESERVOIRS** | | | | | | | | | |
| *CRESCENT R.* | | | | | | | Gc-Is | Gc-Id | Gc-Ii |
| *SALT NICHE R.* | | | | | | | Gn-Is | | |
| *PERIPHERAL WEDGE R.* | | | | | | | GxF-Is GxB-Is | GxF-Id | |
| *PERIPHERAL SEGMENT R.* | | | | | | | GxFxF-Is GxFxB-Is | | |
| *COMPOSITE PIERCEMENT TRAP R.* | | | | | | | G(F)-Is | | |

monocline (homocline or flexure)

Type A-V.—Convex Trap Reservoir in syncline

Type A-VI.—Convex Trap Reservoir in an environment without any structural influence, that is, in a practically horizontal structural area

To this point, the foundation for a reservoir system takes care of only simple reservoirs that are completely defined by a single trap and an environment indicator. However, single-trap reservoirs represent but one group of several morphological varieties of reservoirs. In many places, more than one trap indicator is necessary to complete a trap. Moreover, reservoirs can be modified in many ways by trap indicators which inter-

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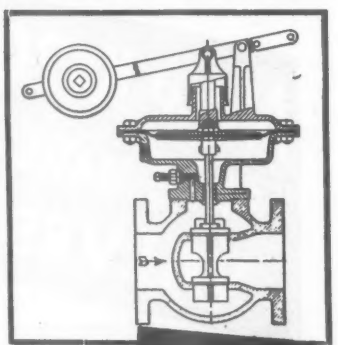

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fere accidentally in the reservoir area. Such indicators then play only an incidental part, since they would not eliminate the trap by their absence. Finally, reservoirs may be made up of several units, either connected by permeability or disconnected.

Therefore, a complete description of petroleum reservoirs and their classification requires consideration of all indicators which are involved in the boundaries of the individual reservoirs. To devise a way fitting all varieties conveniently into the system under discussion, the use of reservoir symbols is adopted. These symbols are based on the letters and numerals applied in the previous enumeration of the reservoir indicators. The manner in which they are arranged to express the various relationships and thereby the different reservoir varieties, is illustrated by the following examples:

In summary, the principal morphological varieties of reservoirs as derived from relationships between the reservoir indicators are the following:

| Reservoir— | Example |
|---|---|
| Single Trap | F-II |
| Double Trap | F×B-II |
| Triple Trap | F×F×B-IV |
| Modified | F/B-II |
| Lenticular | B/II |
| Composite | A(F)-Ia |
| Complex | m(A)-Ia |

The preceding foundation attempts to take into account all trap-forming factors participating in the boundaries of petroleum reservoirs. This permits conducting a systematic examination by logical combination of the established reservoir indicators and thus considering each type of trap condition under each form of structural relation in the entire range from the dome to the syncline. Many reservoirs are indicated in this manner which are rarely, if ever, recognized as typical, and since the system should disclose all types of traps that exist under given structural and stratigraphic conditions, it should serve as an instrument for inductive approach in problems of reservoir control and conservation, in problems of repressuring and flooding, in estimating recovery and reserves, and in the search for untapped petroleum reservoirs in productive areas as well as in exploratory territory.

### Summary

By use of the foregoing system, the great majority of petroleum reservoirs that are formed under typical geological conditions can be classified. A review of very exceptional types might disclose examples which would require further enlargement of the system of classification.

Table 1 lists most known types of reservoirs and is based on the following principles of classification.

1. The logical combination of trap-forming factors which are grouped into trap indicators and structural environment indicators

2. Distinction between essential and incidental function of the indicators involved in the traps

3. A morphological division into reservoir varieties derived from the relationships between trap and environment indicators into

Single-trap reservoirs
Double-trap reservoirs
Triple-trap reservoirs
Modified reservoirs
Lenticular reservoirs
Composite reservoirs
Complex reservoirs

4. A natural division into five reservoir groups based on the trap indicators

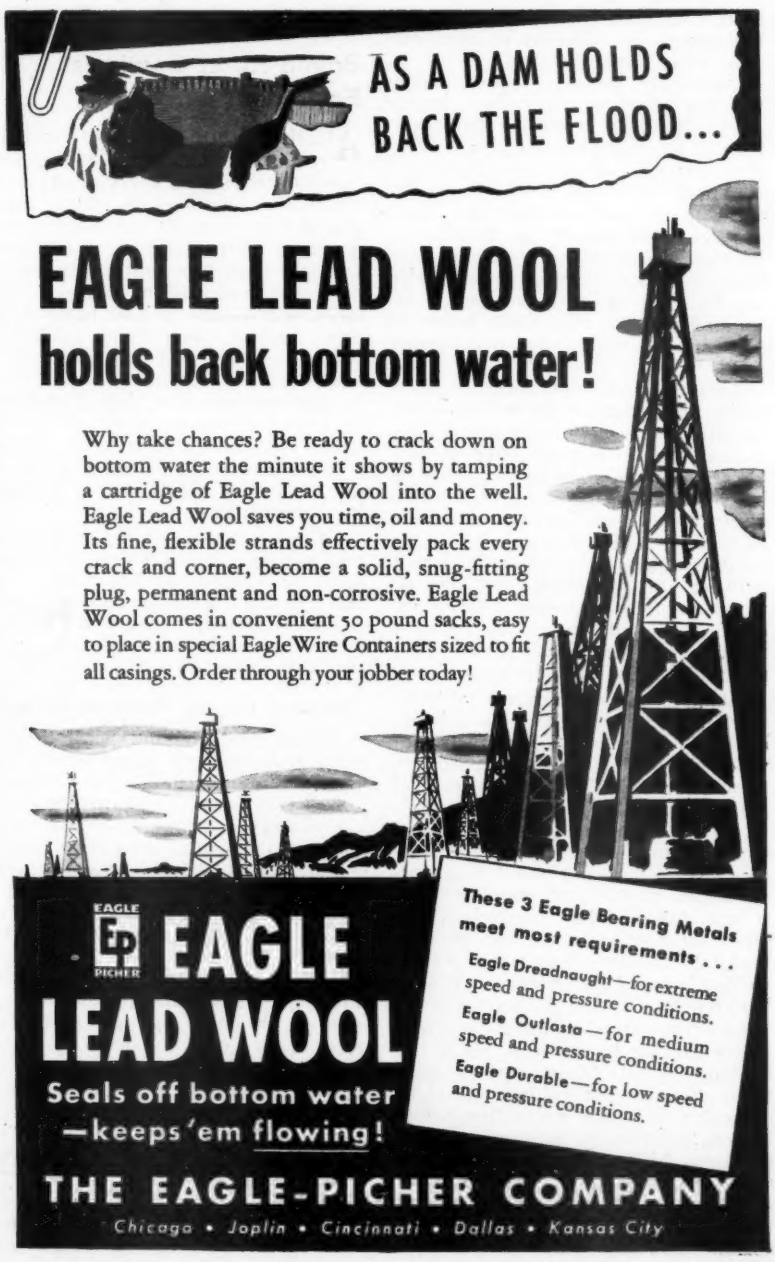
A. Convex trap reservoirs
B. Permeability trap reservoirs
C. Pinch-out trap reservoirs
F. Fault trap reservoirs
G. Piercement trap reservoirs

5. Subdivision of reservoir groups according to morphological reservoir varieties, for example

Simple convex trap reservoirs
Composite convex trap reservoirs
Complex convex trap reservoirs

6. Subdivision of reservoir groups into certain reservoir families differentiated by geological characteristics, for example

Depositional pinch-out reservoirs
Truncated pinch-out reservoirs
Overlap pinch-out reservoirs.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# PROGRESS IN METALS

*by W. L. Nelson*
Consulting Engineer

## Technique of Cladding

DURING the war stainless clad steel has gone into dozens of corrosion-resistant applications where full stainless would take an unnecessary excess of nickel and chromium. This product has an especial appeal in civilian goods items because it gives advantages of stainless at considerably lower cost.

Previously, the only alternative to stainless steel was chromium-plated steel, which in itself created problems of fabrication and had relatively low abrasion resistance. Stainless-clad material is now produced by rolling both the stainless-steel and backing-steel components to their final gage thickness and then attaching the stainless to the backing by spotwelding. This is good for the heavier gages, the union of the two metals being by intermittent welds or overlapping welds.

Another important method is to apply the stainless to its low-alloy backing by a modification of fusion welding before rolling. After the application of the stainless portion in a special intermelting setup through an electric arc, the material is rolled to final gage. Several processes achieve a forge or interdiffusion union between the two components during a hot-working operation. The stainless components prepared for hot working are in pairs, with an inert material, a separator, between them.

Stainless-clad sections are rolled in pairs with one stainless surface facing the other. Assemblies, or ingots, are rolled to double the gage required, then separated through the central plane where the separator had previously been placed. In some cases, when assembling the stainless components the backing metal is a slab on which a sheet of stainless steel is laid, followed by a separator, another sheet of stainless, and another backing slab. This "sandwich" is then welded around the edges so it will hold together during rolling.

Sometimes stainless inserts and separator are set in an ingot mold, the backing metal being cast around them. During hot rolling the chief difficulty is in the oxide film forming on the stainless components. One attains a high ratio of reduction at temperatures of 2,250° to 1,850° F. to spread the thin oxide coat beyond its elastic limit and tear it into small islands critically dispersed in the plane between the two components.

Percentage of cladding can now be controlled so that 10 per cent cladding can be produced down to 3/16-in. thickness and 5 per cent down to ⅜-in. thickness.

An abstract of Townsend, L. W., "Improved Cladding Techniques," Steel, Vol. 117, page 145, 1945, taken from Materials and Methods—November 1945.

## Baked Resin Coatings For Pipes

ALTHOUGH the value of phenolic resins has long been recognized, adequate means of applying them to pipe have been lacking. To a large extent this difficulty has been eliminated by induction-heating methods. Oil-field materials that might be so protected, both internally and externally, are petroleum and natural-gas pipe, heat-exchanger and condenser tubing, boiler tubes, and even parts of the interior of engines. A report on the use of resin baked coatings by Robert J. Moore, technical coordinator, Bakelite Corp., New York, was presented before a recent meeting of the Federation of Paint and Varnish Production Clubs.

"Where corrosion is the problem—not merely decoration—and where paint or varnish in the past have failed or have not even been attempted, there is great opportunity today for the protective-coatings industry," stated Moore.

### Exacting Coating Problems Solved

"While resin baking coatings for years had been extending their field of usefulness in industrial coatings, it was their solving of exacting coating problems during the war that really awakened the paint and varnish manufacturers to their unusual values.

"At the outbreak of the war alarming shortages of corrosion-resistant metals made it necessary to revert to steel. The coatings industry was called upon to supply satisfactory protective finishes for steel, and in addition to solve additional coating problems never before confronted. With their utilization of the phenolic baking resins they were able to meet these requirements and to pass the severe and unusual specifications necessary to guarantee their procurement. Among these requirements the following few are mentioned:

"Corrosion-resistant coating for the steel replacing brass for cartridge cases. The coating was required to withstand the rigors of storage, shipping, and handling and the final fiery blast inside the gun breeches. It was required that the coating remain mirror smooth and unbroken in the breech on firing, where the temperature frequently reaches 600° F., withstanding the explosive expansion and contraction.

"Also the protective coatings for army food containers, portable gasoline tanks, ammunition boxes, many bomb parts, portable water tanks, and metal buckles. A most unusual and exacting requirement was the coating for the interior metal parts of all aircraft engines.

"In replacing chromium plates on machine tools these baked coatings were found to give increased resistance on salt-spray testing.

"The Navy specified resin baking coatings to prevent surface corrosion in the interior of pressure vessels exposed to salt water, alcohol, gasoline, and lubricating oils. The Quartermaster Corps used them on steel hardware items where corrosion and abrasion resistance are of prime importance.

"While supplying these and other requirements drew the attention of many coatings manufacturers to baked phenolic resins for the first time, they really became alert to their values because of the many severe tests required in the procurement specifications. It was these required performance tests and meeting them in the laboratories that astonished many manufacturers with their unusual performance. The alert manufacturer saw in them the answer to many industrial-coating problems and the potential business in many fields not usually entered by paint and varnish products."

Coatings which are ordinarily baked at 275°-400° F. for times of 20 minutes to 1 hour can be accomplished in a few minutes by induction heating. Part of this saving in time results by the fact that the inside of the coating (nearest the pipe) is heated first, thus providing more uniform curing.

Long records of service have been established for boiler tubes and oil-refinery condenser tubes protected by baked resins. In both instances the temperatures of the water (or gasoline vapors) were below 220° F. The baked resin surfaces are resistant to lubricating oils and to 30 per cent calcium chloride solutions. Gas lines lined with resin provide a clean, smooth surface that reduces friction losses.

## Metallurgical Terms

### Carbon Steel

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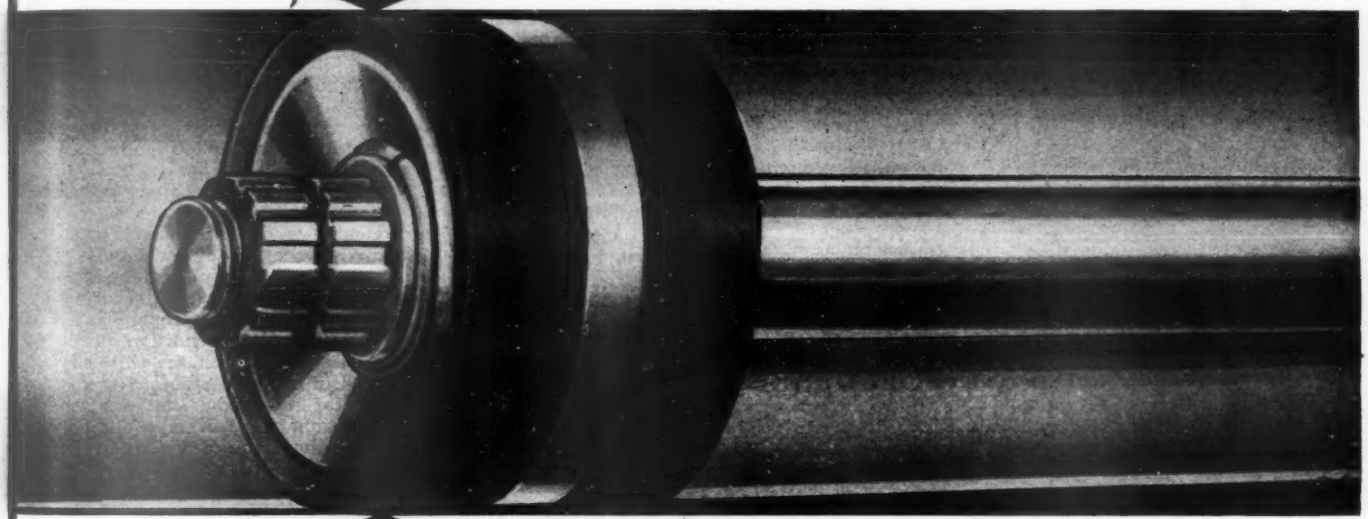

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# Practical Refrigeration For Gasoline Plants

*(Continued from page 136)*

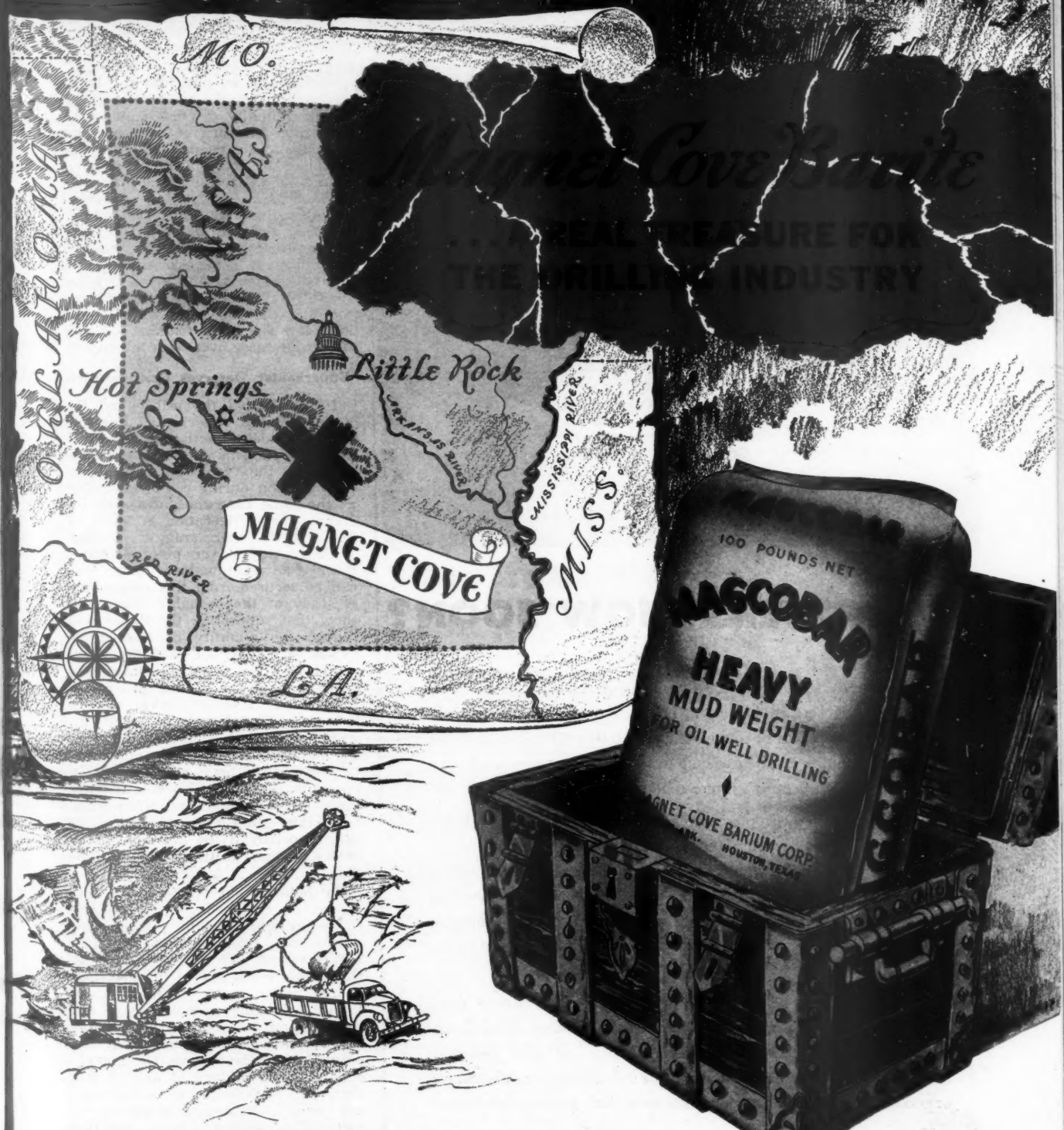
light ends in the plant-propane mixture so that they follow a curve of boiling points between the saturated liquid and vapor limits. From this diagram it is possible to determine the relative amount of heat and the pressures and temperatures that can be expected at any point in the operation. The diagram will show the amount of heat to be removed in the condensers, the effective cooling available in the chillers, the theoretical horsepower of compression, and many more important values. In fact, it will be the engineers' "bible."

A typical flow diagram for a refrigeration cycle on lean oil subcooling is shown in Fig. 4. This is offered as a guide to the general nomenclature and as a base for more detailed discussion on the design of various units. This flow diagram is not submitted with any recommendation that this arrangement is preferable to others. It is only one of several. For example, our condensers are fabricated pipe coils but actually open sections or a closed condenser would be just as suitable. Also, the rundown accumulator can be designed for greater capacity and allowed to take any fluctuations in the liquid propane in the system. In such a condition the level control would be on the chiller unit instead of the accumulator. It is important to study the condenser under conditions of poorest cooling to determine the value of added surface against the horse power of compression. The Mollier diagram will show the temperature - pressure relationship in the condensers and the special curve (Fig. 2) should show these values even more clearly. This change in pressure with the condenser temperature must be used in determining the relative values of added surface and additional compressor capacity.

### Types of Oil Chillers

Oil chillers are generally constructed in one or two types. First, a chiller without any vapor space in it which operates in conjunction with a surge tank. Second, a type with a vapor space that allows a level to be maintained within the unit. In either case the size of the chiller should be balanced against the compressor capacity since within reasonable economic limits the same cooling can be secured by either means.

The lubricating oil from the compressor cylinders must be removed from the system before its volume builds up to the point that temperatures are affected or the liquid begins foaming. It is not felt to be economic to take any steps to remove the oil from the vapor at the compressor discharge since sufficient oil will

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probably get by and into the liquid propane to require its removal at this point. Actually a pure mineral lubricating oil offers no operating problem and a deoiler can easily be installed to accomplish its removal before any excessive concentration is possible. A side stream of the oil or other material to be cooled may be used for heating and since the cooling effect of the propane may be utilized there is no economic reason for not designing the deoiler rather liberally. It must be remembered too that the lube-oil level must be kept low since the foaming oil will otherwise carry over with the vapors.

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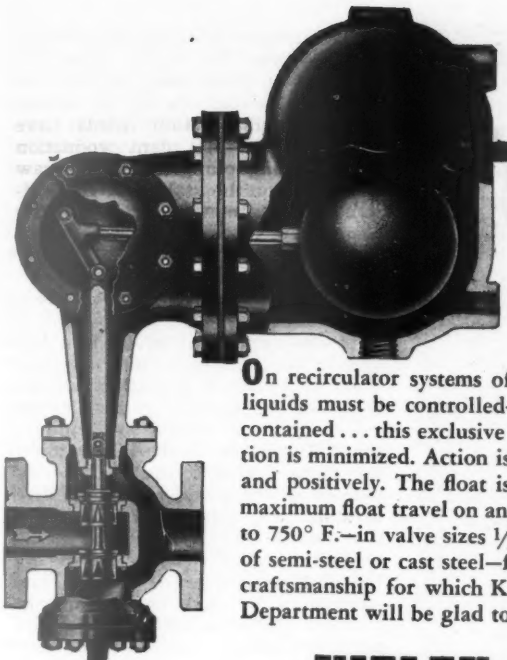
It is felt that the utility and the design of the superheater deserves more consideration than is generally accorded it. This unit not only superheats the vapor and prevents condensation during compression but at the same time the subcooling increases the refrigeration in terms of horse power per unit of cooling. With an impure, or plant propane, there is an additional advantage that can be secured from this subcooling. A study of the enthalpy chart will show that subcooling the liquid will reduce the quantity of flash upon expansion and at the same time will also reduce the flash temperature of the plant propane. If the chillers are designed to take advantage of this reduced temperature, and the increased temperature difference that can result, greater refrigeration can be secured without any change in operating pressures. This will increase the net refrigeration and offers some very interesting economic possibilities, especially if the available horse power assigned to this service is limited.

We believe that the complete unit should be designed for 250 psi. or the equivalent working pressure required for plant-propane storage. Safety valves will be set to work at this pressure but except for fire they should never operate. With this allowable working pressure even the engines can be shut down without the necessity of releasing any of the propane from the system. The knowledge that the failure of any of the controls, or of the compressors, cannot cause a hazardous condition to materialize, allows a very healthy feeling of security on the part of all concerned. The cost of this added safety is nominal.

Propane refrigeration units have been added to two of Signal Oil & Gas Co.'s low-pressure absorption plants during the last year. At Signal Hill this allowed one plant efficiently to handle the wet gas previously treated in two plants. At Huntington Beach this addition was required to allow the plant to maintain its efficiency with the increased volumes of wet gas to be processed. The two



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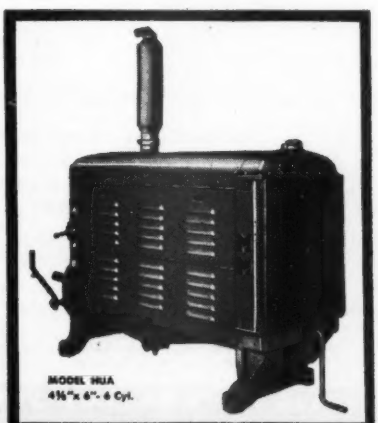


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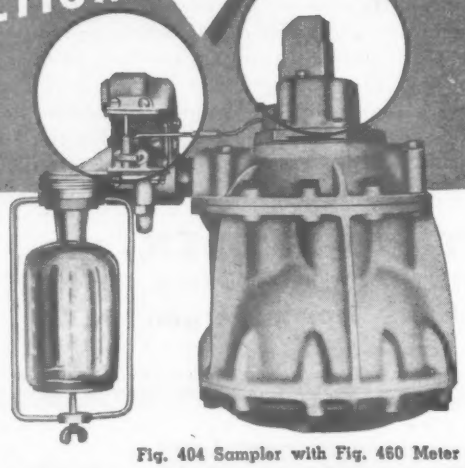

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units are naturally somewhat similar in their flow (Fig. 4) but differ considerably in their construction, especially in the case of the oil chillers (Figs. 5 and 6). Both plants have chillers on the total plant production as it is being pumped into the raw feed tank for the stabilizer. In addition, the Huntington Beach plant has a chiller on the natural gasoline and uncondensed vapors from the still run down condensers (Fig. 9).

Both plants better their estimated performance and have provided no unforeseen operating problem or hazard. In fact, the only unusual condition in a year of operation was the result of the failure of the air supply to the level control on accumulator at Huntington Beach. This allowed the motor valve controlling the expansion of the liquid into the chillers to stand wide open and allowed all the liquid and a relatively small quantity of the vapors to pass into the chiller. The result was a small increase in the vapor load to the compressors and a decrease in the compressor discharge pressure of a few pounds, since full condensation was not required. The higher propane pressure in chillers raised the oil temperature a few degrees but not enough to upset the plant operation and no hazard resulted from this failure.

### Performance Data

A set of operating and performance data for both plants is included (Table 2). In general these are in good agreement with the Mollier diagram. For further comparison a set of the enthalpy data for Huntington Beach is given below:

| | B.t.u./lb. |
|---|---|
| Compression— | |
| Inlet vapor—94 psia. and 61° | 296 |
| Discharge—174 psia. and 108° | 309 |
| Work of compression | — 15 |
| Condensation— | B.t.u./lb. |
| Inlet, 173 psia. and 117° | 313 |
| Outlet, 171 psia. and 85° | 157 |
| Heat of condensation | 156 |
| Superheater— | B.t.u./lb. |
| Liquid in 171 psia. and 85° | 157 |
| Liquid out Sat. liquid and 80° | 153 |
| Subcooling | 4 |
| Refrigeration— | B.t.u./lb. |
| Liquid in 98 psia. and 48° | 153 |
| Vapor out 98 psia. and 53° | 292 |
| Net refrigeration | —139 |

The data taken from the Mollier diagram agree with the actual test data very closely except for the compressor performance. In this case the Mollier diagram gives a 108° F. discharge temperature while it was actually 125° F. Also, the 15 B.t.u./lb. for the theoretical work of compression is too low a value. Both differences are due primarily to the fact that our intake and discharge pressures are secured from pipe-line connections. Actually the pressure losses

through the compressor valves will result in a lower intake and a higher discharge pressures within the cylinder and therefore a greater ratio of compression and increased theoretical horsepower. Since the ratios of compression for this work are generally about 2.0, or less, a small change in either pressure can result in a relatively large percentage increase in horse power. Also, the jacket cooling water is generally warmer than the propane to the cylinder and therefore gives up heat in the cylinder and heats rather than cools the vapor.

This difference in readings is typical and must be considered in any design before any value is accepted for the compressor horsepower. The actual horsepower required to compress propane is less than generally required for natural gases due to the relatively low ratio of specific heats (1.17). For this reason one of the more generally accepted curves of horsepower per 1,000 M.c.f./day for different ratios of compression, can be used or any other curve or empirical data with which the reader is familiar and can interpret for this type of service.

Continuing the discussion of our actual operating and design data, there are several other points of interest in connection with the compressors. These include the use of a nonreturn or a check valve which should be installed on the discharge of the compressor. We also feel it is better to install the compressor intake line so that it rises and makes a 180° bend with the shutoff valve on the riser. This reduces the possibility of liquid accumulating above the intake valve during periods when the compressor is down (Fig. 7). In cases where the shutoff valve must be placed in a position that would allow the accumulation of liquid between the valve and the header it is very important to install a bleeder that will permit complete drainage of any liquid before the engine is started.

We believe that there are a number of advantages favoring the use of a slightly oversize compressor cylinder and then bringing it down to the desired operating range by the use of clearance bottles. The most important of these advantages is the flexibility that is offered. This not only allows the correct capacity for

**TABLE 2—OPERATING DATA**

| | Signal Hill | Huntington Beach |
|---|---|---|
| **General—** | | |
| Oil rate—1,000 gal./day | 585 | 1,110 |
| Nat. gasoline—gal./day | 28,500 | 45,500 |
| Propane refrigerant— | | |
| M.c.f./day | 3,260 | 5,520 |
| Lb./hr. | 15,800 | 27,000 |
| Gal./min. | 62 | 105 |
| **Condensers—** | | |
| Surface (o.d.)—sq. ft. | 3,670 | 5,810 |
| Pressure—in | 152 | 173 |
| —out | 148 | 171 |
| Temperature—in | 106 | 117 |
| —out | 76 | 85 |
| **Superheater—** | | |
| Surface (o.d)—sq. ft. | 385 | 250 |
| Temperatures— | | |
| Vapor—in | 46 | 53 |
| —out | 58 | 60 |
| Liquid—in | 76 | 85 |
| —out | 67 | 80 |
| **Oil chillers—** | | |
| Surface (o.d.)—sq. ft. | 2,660 | 7,650 |
| Propane—Gal./min. | | 93 |
| Pressures— | | |
| Oil—in | 92 | 72 |
| —out | 84 | 65 |
| Chiller | 88 | 98 |
| Temperatures— | | |
| Oil—in | 74 | 73 |
| —out | 49 | 53 |
| Propane—flash | | 48 |
| —Final | | 53 |
| —Surge | 46 | |
| **Gasoline chillers—** | | |
| Surface—sq. ft. | 450 | 450 |
| Pressures— | | |
| Gasoline—in | 105 | 105 |
| Propane | 88 | 105 |
| Temperatures— | | |
| Gasoline—in | 87 | 82 |
| —out | 63 | 60 |
| Propane | 46 | 55 |
| **Compressors—** | | |
| Pressures— | | |
| Intake | 87 | 94 |
| Discharge | 152 | 174 |
| Compression ratio | 1.75 | 1.85 |
| Temperatures— | | |
| Intake | 58 | 61 |
| Discharge | 113 | 125 |
| Engine cooling water | 110 | 110 |

**REMARKS**

One-third additional compressor capacity is being installed at Huntington Beach.

Pressures given in psia. and temperature in °F.

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the calculated design conditions to be secured but will allow a clearance adjustment to be made at any time to meet further or changed operations over a wide range of conditions. Also, clearance pockets have less effect on the cylinder at low compression ratios such as exist under the higher intake pressures and higher loads. For this reason when the atmospheric cooling is the poorest and the chillers are producing the greatest cooling effect, the compressor cylinders are handling this increased volume of propane with the highest relative efficiency. This is an ideal situation since it allows the greatest load to result at those times when the value is greatest and higher horsepower can be justified.

The condensers in our plants are pipe coils designed for the necessary drainage to handle full condensation without unnecessary pressure drop. It can be seen from the Mollier diagram that there will be a relatively large mean temperature difference (m.t.d.) between the cooling water and the propane except for the last 10 per cent, or less when the plant-propane temperature curve swings up as a result of the light hydrocarbons which reduces the temperature differences very materially. Actual test data indicate that half of the heat of condensation was done in the first 30 per cent and two-thirds in 50 per cent of the coil.

In the Huntington Beach plant the oil chiller was designed to utilize the range in boiling temperatures available in a plant propane at a constant pressure. The oil chillers at this plant consist of one 39-in. by 65-ft. and two parallel 25-in. and 65-ft. long units in series flow. The propane is expanded into one end of the 39-in. chiller and travels the length of this unit before it overflows a weir that maintains the level of the propane and flows into the other chiller. The chillers are piped for counter flow. The propane temperature increases about 5° between the point of expansion and the end of the chillers. These changing temperatures can be checked on the Mollier diagram and are obviously worth consideration as a means of increasing the m.t.d. and therefore the actual cooling. It will be noted in the operating data that our final oil temperature is 53° which is the same as the final propane temperature. The initial, or flash, temperature of the propane is 48° F.

These chillers at Huntington Beach make use of standard 1-in. pipe for tubes and were fabricated in place. These pipe tubes were placed in the lower two-thirds of the shell which leaves the top third for vapor space. We also utilize these oil chillers for the small amount of working storage that is necessary to avoid adding propane more often than necessary. The minimum level of propane for efficient operation is indicated by a superheating of the vapors as a result of the direct contact with the tubes as the level drops too low. This minimum efficient level can be determined definitely if thermometers are installed in both liquid and vapors. This will then give a reliable minimum level that can be indicated by a gage-glass reading during normal operation.

At Signal Hill, commercial exchange units were installed. They have performed as well as could be desired. However, with this type of design, which is very similar to that shown in the flow design, there is no means of taking efficient advantage of the lower flash temperature and slightly greater surface is required for the same refrigeration. The economic choice between these two types of cooler will depend upon individual conditions and this can be decided after considering both possibilities.

The deoiler must secure its feed from the point where there will normally be the greatest concentration of lubricating oil in the system. At Signal Hill where the propane is in constant circulation the supply is taken from the surge tank. At Huntington Beach the propane enters at the end of a long horizontal chilling unit and flows lengthwise through this unit. For this reason the lubri-


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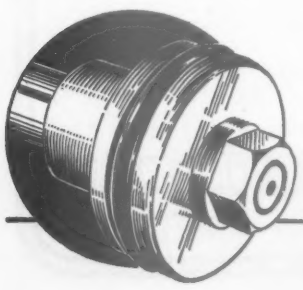

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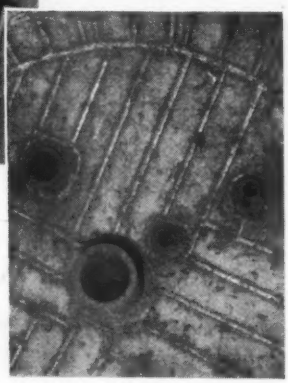

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cating oil will become concentrated at the end of the unit and the feed for the deoiler is taken from this point of greatest concentration. In this plant where the design allows the lubricating oil to concentrate within the system, the problem of removing the oil is obviously simplified.

To further describe the units, at Huntington Beach we have chillers on both our run down gasoline and uncondensed vapors and on the raw production into the stabilizer feed tank (Fig. 9). These units are independent of our oil chillers and are located in another area of the plant. Both are converted exchanger units and are connected top and bottom to a propane surge tank. A level control on the surge tank maintains an independent level in this tank. A small drain line to the deoiler is used to remove the lubricating oil that concentrates in this unit.

The chiller unit on the run-down liquid and uncondensed vapors from the still condenser is used to control the volume of vapors which must be handled by the vapor compressor. The other chiller unit is on the plant production to the stabilizer feed tank and in this case the cooling permits a lower pressure for separation of the excess light fractions. This lower temperature allows a better separation of the light hydrocarbons because of their relatively smaller reduction in vapor pressure at these colder temperatures[5]. The amount of cooling on each chiller is regulated manually by an occasional adjustment of the valve on the vapor line out of the exchanger and into the surge tank. It has been found that very even control can be secured by this means and the back-pressure valves or controllers were not necessary. The addition of these two chillers allowed us to continue with the same vapor compressor as existed in the plant before the addition of the refrigeration unit and the resulting increased extraction of light hydrocarbons. It was found that the refrigeration horsepower necessary to reduce the vapor volume and lower the discharge pressure is approximately 60 per cent of the horsepower that would have been required to handle the additional vapors without this refrigeration. The additional 40 per cent of the horsepower is available for additional refrigeration. There has been no problem in connection with this operation.

### Conclusion

In conclusion, we are firmly convinced that refrigeration can be justified in a new low-pressure absorption plant in cases where the future maximum volumes of wet gas are known within reasonably close limits, or where the atmospheric temperatures and humidity are too high to allow efficient atmospheric cooling. We realize that refrigeration is also justified in many high-pressure operations but we have limited this paper to low-pressure absorption where the advantages to be gained are probably more pronounced, due primarily to the fact that a greater cooling range is possible without danger of hydrate or ice formations.

The use of refrigeration is also felt to be the simplest and most economical means of securing additional plant capacity in existing plants. Experience has shown that the problems of operating and maintaining a refrigeration plant are extremely few and of minor importance. It also indicates that no unusual hazards result from the use of propane refrigerant. It is believed that practically any plant can develop a supply of propane at very small cost that will prove acceptable as a refrigerant for this type of operation.

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$$\text{Baume for liquids heavier than water} = 145 - \frac{145}{\text{Sp. Gr.}}$$

Allowance for temperature:
At 10°-15° Be., 0.025° Be. or 0.0002 sp. gr. for each °F.
At 15°-22° Be., 0.033° Be. or 0.0003 sp. gr. for each °F.
At 22°-25° Be., 0.036° Be. or 0.00035 sp. gr. for each °F.

| Degrees Baume | Specific gravity 60/60 °F. | Degrees Twaddell | Per cent hydrochloric acid HCl | Gm. HCl per liter* | Lb. HCl per gal.* |
|---|---|---|---|---|---|
| 1.00 | 1.0069 | 1.38 | 1.40 | 14.096 | 0.12 |
| 2.00 | 1.0140 | 2.80 | 2.82 | 28.595 | 0.24 |
| 3.00 | 1.0211 | 4.22 | 4.25 | 43.396 | 0.36 |
| 4.00 | 1.0284 | 5.68 | 5.69 | 58.515 | 0.49 |
| 5.00 | 1.0357 | 7.14 | 7.15 | 74.07 | 0.62 |
| 5.25 | 1.0375 | 7.50 | 7.52 | 78.02 | 0.65 |
| 5.50 | 1.0394 | 7.88 | 7.89 | 82.03 | 0.68 |
| 5.75 | 1.0413 | 8.26 | 8.26 | 86.11 | 0.72 |
| 6.00 | 1.0432 | 8.64 | 8.64 | 90.13 | 0.75 |
| 6.25 | 1.0450 | 9.00 | 9.02 | 94.25 | 0.78 |
| 6.50 | 1.0469 | 9.38 | 9.40 | 98.40 | 0.82 |
| 6.75 | 1.0488 | 9.76 | 9.78 | 102.57 | 0.85 |
| 7.00 | 1.0507 | 10.14 | 10.17 | 106.85 | 0.89 |
| 7.25 | 1.0526 | 10.52 | 10.55 | 111.05 | 0.93 |
| 7.50 | 1.0545 | 10.90 | 10.94 | 115.37 | 0.96 |
| 7.75 | 1.0564 | 11.28 | 11.32 | 119.58 | 0.99 |
| 8.00 | 1.0584 | 11.68 | 11.71 | 123.95 | 1.03 |
| 8.25 | 1.0603 | 12.06 | 12.09 | 128.18 | 1.07 |
| 8.50 | 1.0623 | 12.46 | 12.48 | 132.57 | 1.11 |
| 8.75 | 1.0642 | 12.84 | 12.87 | 136.95 | 1.14 |
| 9.00 | 1.0662 | 13.24 | 13.28 | 141.37 | 1.18 |
| 9.25 | 1.0681 | 13.62 | 13.65 | 145.81 | 1.21 |
| 9.50 | 1.0701 | 14.02 | 14.04 | 150.25 | 1.25 |
| 9.75 | 1.0721 | 14.42 | 14.43 | 154.7 | 1.29 |
| 10.00 | 1.0741 | 14.82 | 14.83 | 159.4 | 1.33 |
| 10.25 | 1.0761 | 15.22 | 15.22 | 163.8 | 1.37 |
| 10.50 | 1.0781 | 15.62 | 15.62 | 168.4 | 1.41 |
| 10.75 | 1.0801 | 16.02 | 16.01 | 172.9 | 1.44 |
| 11.00 | 1.0821 | 16.42 | 16.41 | 177.6 | 1.48 |
| 11.25 | 1.0841 | 16.82 | 16.81 | 182.2 | 1.52 |
| 11.50 | 1.0861 | 17.22 | 17.21 | 186.9 | 1.56 |
| 11.75 | 1.0881 | 17.62 | 17.61 | 191.6 | 1.60 |
| 12.00 | 1.0902 | 18.04 | 18.01 | 196.4 | 1.64 |
| 12.25 | 1.0922 | 18.44 | 18.41 | 201.1 | 1.68 |
| 12.50 | 1.0943 | 18.86 | 18.82 | 205.9 | 1.72 |
| 12.75 | 1.0964 | 19.28 | 19.22 | 210.7 | 1.76 |
| 13.00 | 1.0985 | 19.70 | 19.63 | 215.6 | 1.80 |
| 13.25 | 1.1006 | 20.12 | 20.04 | 220.6 | 1.84 |
| 13.50 | 1.1027 | 20.54 | 20.45 | 225.5 | 1.88 |
| 13.75 | 1.1048 | 20.96 | 20.86 | 230.4 | 1.92 |
| 14.00 | 1.1069 | 21.38 | 21.27 | 235.5 | 1.96 |
| 14.25 | 1.1090 | 21.80 | 21.68 | 240.4 | 2.00 |
| 14.50 | 1.1111 | 22.22 | 22.09 | 245.5 | 2.04 |
| 14.75 | 1.1132 | 22.64 | 22.50 | 250.5 | 2.09 |
| 15.00 | 1.1154 | 23.08 | 22.92 | 255.6 | 2.13 |
| 15.25 | 1.1176 | 23.52 | 23.33 | 260.7 | 2.17 |
| 15.50 | 1.1197 | 23.94 | 23.75 | 265.9 | 2.21 |
| 15.75 | 1.1219 | 24.38 | 24.16 | 271.0 | 2.26 |
| 16.00 | 1.1240 | 24.80 | 24.57 | 276.0 | 2.30 |
| 16.1 | 1.1248 | 24.96 | 24.73 | 278.0 | 2.32 |
| 16.2 | 1.1256 | 25.12 | 24.90 | 280.0 | 2.33 |
| 16.3 | 1.1265 | 25.30 | 25.06 | 282.0 | 2.35 |
| 16.4 | 1.1274 | 25.48 | 25.23 | 284.0 | 2.37 |
| 16.5 | 1.1283 | 25.66 | 25.39 | 286.0 | 2.38 |
| 16.6 | 1.1292 | 25.84 | 25.56 | 288.0 | 2.40 |
| 16.7 | 1.1301 | 26.02 | 25.72 | 290.0 | 2.42 |
| 16.8 | 1.1310 | 26.20 | 25.89 | 293.0 | 2.44 |
| 16.9 | 1.1319 | 26.38 | 26.05 | 295.0 | 2.46 |
| 17.0 | 1.1328 | 26.56 | 26.22 | 297.0 | 2.48 |
| 17.1 | 1.1336 | 26.72 | 26.39 | 299.0 | 2.50 |
| 17.2 | 1.1345 | 26.90 | 26.56 | 302.0 | 2.52 |
| 17.3 | 1.1354 | 27.08 | 26.73 | 304.0 | 2.53 |
| 17.4 | 1.1363 | 27.26 | 26.90 | 306.0 | 2.55 |
| 17.5 | 1.1372 | 27.44 | 27.07 | 308.0 | 2.56 |
| 17.6 | 1.1381 | 27.62 | 27.24 | 310.0 | 2.58 |
| 17.7 | 1.1390 | 27.80 | 27.41 | 312.0 | 2.60 |
| 17.8 | 1.1399 | 27.98 | 27.58 | 314.0 | 2.62 |
| 17.9 | 1.1408 | 28.16 | 27.75 | 316.0 | 2.64 |
| 18.0 | 1.1417 | 28.34 | 27.92 | 319.0 | 2.66 |
| 18.1 | 1.1426 | 28.52 | 28.09 | 322.0 | 2.68 |
| 18.2 | 1.1435 | 28.70 | 28.26 | 324.0 | 2.70 |
| 18.3 | 1.1444 | 28.88 | 28.44 | 326.0 | 2.72 |
| 18.4 | 1.1453 | 29.06 | 28.61 | 329.0 | 2.74 |
| 18.5 | 1.1462 | 29.24 | 28.78 | 331.0 | 2.76 |
| 18.6 | 1.1471 | 29.42 | 28.95 | 333.0 | 2.78 |
| 18.7 | 1.1480 | 29.60 | 29.13 | 335.0 | 2.80 |
| 18.8 | 1.1489 | 29.78 | 29.30 | 338.0 | 2.82 |
| 18.9 | 1.1498 | 29.96 | 29.48 | 340.0 | 2.84 |
| 19.0 | 1.1508 | 30.16 | 29.65 | 342.0 | 2.85 |
| 19.1 | 1.1517 | 30.34 | 29.83 | 344.0 | 2.87 |
| 19.2 | 1.1526 | 30.52 | 30.00 | 347.0 | 2.89 |
| 19.3 | 1.1535 | 30.70 | 30.18 | 349.0 | 2.91 |
| 19.4 | 1.1544 | 30.88 | 30.35 | 352.0 | 2.93 |
| 19.5 | 1.1554 | 31.08 | 30.53 | 354.0 | 2.95 |
| 19.6 | 1.1563 | 31.26 | 30.71 | 356.0 | 2.97 |
| 19.7 | 1.1572 | 31.44 | 30.90 | 359.0 | 2.99 |
| 19.8 | 1.1581 | 31.62 | 31.08 | 361.0 | 3.01 |
| 19.9 | 1.1590 | 31.80 | 31.27 | 363.0 | 3.03 |
| 20.0 | 1.1600 | 32.00 | 31.45 | 365.0 | 3.05 |
| 20.1 | 1.1609 | 32.18 | 31.64 | 368.0 | 3.07 |
| 20.2 | 1.1619 | 32.38 | 31.82 | 370.0 | 3.08 |
| 20.3 | 1.1628 | 32.56 | 32.01 | 372.0 | 3.10 |
| 20.4 | 1.1637 | 32.74 | 32.19 | 375.0 | 3.12 |
| 20.5 | 1.1647 | 32.94 | 32.38 | 377.0 | 3.14 |
| 20.6 | 1.1656 | 33.12 | 32.56 | 379.0 | 3.16 |
| 20.7 | 1.1666 | 33.32 | 32.75 | 382.0 | 3.18 |
| 20.8 | 1.1675 | 33.50 | 32.93 | 384.0 | 3.20 |
| 20.9 | 1.1684 | 33.68 | 33.12 | 386.0 | 3.22 |
| 21.0 | 1.1694 | 33.88 | 33.31 | 389.0 | 3.24 |
| 21.1 | 1.1703 | 34.06 | 33.50 | 391.0 | 3.26 |
| 21.2 | 1.1713 | 34.26 | 33.69 | 394.0 | 3.28 |
| 21.3 | 1.1722 | 34.44 | 33.08 | 396.0 | 3.30 |
| 21.4 | 1.1732 | 34.64 | 34.07 | 399.0 | 3.32 |
| 21.5 | 1.1741 | 34.82 | 34.26 | 401.0 | 3.34 |
| 21.6 | 1.1751 | 35.02 | 34.45 | 403.0 | 3.36 |
| 21.7 | 1.1760 | 35.20 | 34.64 | 406.0 | 3.38 |
| 21.8 | 1.1770 | 35.40 | 34.83 | 408.0 | 3.41 |
| 21.9 | 1.1779 | 35.58 | 35.02 | 411.0 | 3.43 |
| 22.0 | 1.1789 | 35.78 | 35.21 | 414.0 | 3.45 |
| 22.1 | 1.1798 | 35.96 | 35.40 | 417.0 | 3.48 |
| 22.2 | 1.1808 | 36.16 | 35.59 | 420.0 | 3.50 |
| 22.3 | 1.1817 | 36.34 | 35.78 | 423.0 | 3.53 |
| 22.4 | 1.1827 | 36.54 | 35.97 | 426.0 | 3.55 |
| 22.5 | 1.1836 | 36.72 | 36.16 | 428.0 | 3.57 |
| 22.6 | 1.1846 | 36.92 | 36.35 | 431.0 | 3.59 |
| 22.7 | 1.1856 | 37.12 | 36.54 | 433.0 | 3.61 |
| 22.8 | 1.1866 | 37.32 | 36.73 | 435.0 | 3.63 |
| 22.9 | 1.1875 | 37.50 | 36.93 | 438.0 | 3.65 |
| 23.0 | 1.1885 | 37.70 | 37.14 | 441.0 | 3.67 |
| 23.1 | 1.1895 | 37.90 | 37.36 | 444.0 | 3.70 |
| 23.2 | 1.1904 | 38.08 | 37.58 | 447.0 | 3.72 |
| 23.3 | 1.1914 | 38.28 | 37.80 | 450.0 | 3.75 |
| 23.4 | 1.1924 | 38.48 | 38.03 | 453.0 | 3.78 |
| 23.5 | 1.1934 | 38.68 | 38.26 | 456.0 | 3.80 |
| 23.6 | 1.1944 | 38.88 | 38.49 | 459.0 | 3.82 |
| 23.7 | 1.1953 | 39.06 | 38.72 | 463.0 | 3.85 |
| 23.8 | 1.1963 | 39.26 | 38.95 | 466.0 | 3.88 |
| 23.9 | 1.1973 | 39.46 | 39.18 | 469.0 | 3.91 |
| 24.0 | 1.1983 | 39.66 | 39.41 | 472.0 | 3.94 |
| 24.1 | 1.1993 | 39.86 | 39.64 | 475.0 | 3.96 |
| 24.2 | 1.2003 | 40.06 | 39.86 | 478.0 | 3.98 |
| 24.3 | 1.2013 | 40.26 | 40.09 | 481.0 | 4.01 |
| 24.4 | 1.2023 | 40.46 | 40.32 | 484.0 | 4.04 |
| 24.5 | 1.2033 | 40.66 | 40.55 | 487.0 | 4.06 |
| 24.6 | 1.2043 | 40.86 | 40.78 | 490.0 | 4.08 |
| 24.7 | 1.2053 | 41.06 | 41.01 | 493.0 | 4.11 |
| 24.8 | 1.2063 | 41.26 | 41.24 | 496.0 | 4.13 |
| 24.9 | 1.2073 | 41.46 | 41.48 | 499.0 | 4.16 |
| 25.0 | 1.2083 | 41.66 | 41.72 | 502.0 | 4.19 |
| 25.1 | 1.2093 | 41.86 | 41.99 | 506.0 | 4.22 |
| 25.2 | 1.2103 | 42.06 | 42.30 | 511.0 | 4.26 |
| 25.3 | 1.2114 | 42.28 | 42.64 | 516.0 | 4.30 |
| 25.4 | 1.2124 | 42.48 | 43.01 | 521.0 | 4.35 |
| 25.5 | 1.2134 | 42.68 | 43.40 | 526.0 | 4.39 |

*Not contributed by Manufacturing Chemists Association.

No. 82 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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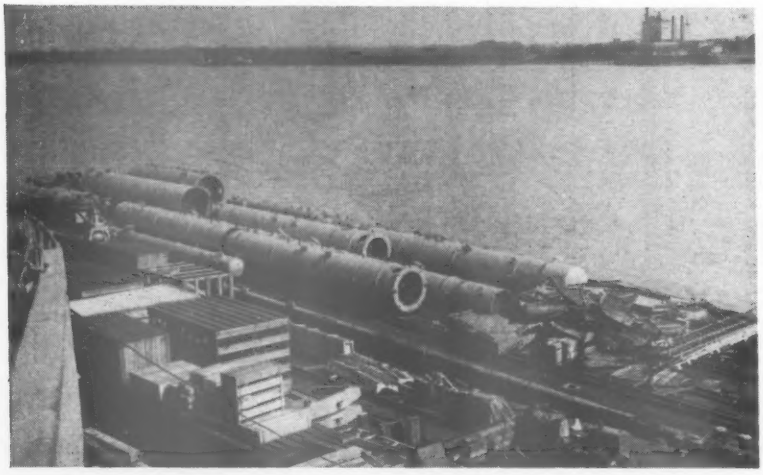

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# Natural Gas

## Greene Appointed Head of A.G.A. Membership Group

NEW YORK.—J. N. Greene, president of Alabama Gas Co., is chairman of a new American Gas Association membership committee which is charged with making the association 100 per cent representative of the industry.

*J. N. GREENE*

Most companies already are enrolled in the association, and the committee will work to sign the comparatively few remaining. Kurwin R. Boyes, association secretary, will serve as committee secretary. Committee members, each responsible for a section of the country, are E. H. Eacker, vice president, Boston Consolidated Gas Co.; John A. Frick, president, Allentown-Bethlehem (Pa.) Gas Co.; Edward M. Borger, president, Peoples Natural Gas Co., Pittsburgh; R. C. Brehaut, manager, suburban companies, Washington (D.C.) Gas Light Co.; A. H. Stack, president, Tampa Gas Co.; D. H. Frazer, Jr., president, Battle Creek (Mich.) Gas Co.; B. F. Pickard, president, Interstate Power Co., Dubuque, Ia.; E. H. Lewis, vice president, St. Louis County Gas Co.; Chester L. May, vice president, Lone Star Gas Co. (Dallas); F. T. Parks, vice president, Public Service Co. of Colorado; N. Henry Gellert, president, Seattle Gas Co; and C. P. Rather, president, Southern Natural Gas Co., Birmingham, for pipe line companies.

## Lone Star Building Plant To Handle East Texas Gas

DALLAS.—A natural-gas processing plant with 100,000,000 cu. ft. daily capacity—half for pipe-line delivery and half for cycling—is being erected 8 miles north of Carthage by Lone Star Producing Co.

Designed to tap one of the largest gas-distillate reserves in the world, the installation is jointly owned by the company and Roger Lacy of Longview. Cycled gas will be returned to the formation while pipeline gas will be delivered to the Lone Star Gas Co. network through the 14-in. Carthage-Opelika line now being constructed.

Lone Star's Willow Springs cycling plant is being dismantled to furnish equipment for the Carthage project, although separators will remain at Willow Springs to continue gas deliveries there. Cecil W. Louks, who is supervising construction of the Carthage plant, will be superintendent after its completion.

## Approval Asked for Gas In Four New York Areas

NEW YORK. — An application to supply straight natural gas in place of mixed and manufactured gas in Syracuse, Utica, Rome, and Watertown, N. Y., has been placed before the Federal Power Commission and New York's Public Service Commission by Central New York Power Corp. Natural gas from West Virginia and Texas will be provided Central New York Power under a 20-year contract with New York Natural Gas Corp.

## Commissioners Continue To Oppose Mexico Line

HOUSTON.—Two members of the Texas Railroad Commission are standing firm on their opposition to the once-rejected international pipe line proposal which would carry 60,000,000 cu. ft. of natural gas daily into Mexico.

Chairman Olin Culberson and Beauford Jester announced they will continue to fight the application before the Federal Power Commission in which La Gloria Corp. proposes to deliver gas from La Blanca field to the Reynosa Pipe Line Co. at the border where it would be piped on to Monterrey. The request was turned down earlier but a rehearing was granted in December and no ruling has yet been given.

## Hearing Set February 25 On Kansas Gas Demand

TOPEKA.—Market demand for natural gas in March, April, and May, from three Kansas fields will be determined at a meeting of the state Corporation Commission in Wichita February 25. The fields are Cunningham field, Kingman and Pratt counties, Otis field, Rush and Barton counties, and Zenith field, Stafford and Reno counties.

## Pressure Maintenance Plan Asked For Stratton Field

AUSTIN.—A pressure maintenance program in the Bertram and Wardner sands of Stratton field, Neuces and Kleberg counties, Texas, is proposed by Southern Minerals Corp. in an application set for hearing before the Texas Railroad Commission March 12.

The corporation was joined by Chicago Corp., in the request.

Mills Bennett has applied to the Texas Railroad Commission for authorization to gas repressure properties in the Lopez field, Webb County, Texas; Sun Oil Co. similarly to install a pressure maintenance plant and producing operation in the Weil field, Jim Hogg County, Texas.

# Natural Gasoline

## Raigordsky Is in Charge of N.G.A.A. Meeting Program

DALLAS.—Preparation of the program for the 25th annual meeting of the Natural Gasoline Association of America to be held here April 17-19 is being directed by P. M. Raigordsky, Houston. Wartime changes in the industry will be the general theme of the association's first meeting in two years, according to J. H. Dunn, president.

## Gas-to-Gasoline Plant To Be Built in Texas

FORT WORTH.—Latest addition to the expanding commercial market of natural gas is the proposed $14,000,000 Brownsville plant which Carthage Hydrocol, Inc., will build to synthesize approximately 5,900 bbl. of gasoline daily.

An estimated 60,000,000 cu. ft. of natural gas a day will be drawn into the plant to produce the gasoline and an additional 1,100 bbl. of diesel fuel and other oils. The gasoline will result from use of the Hydrocol process.

E. O. Thompson, Texas railroad commissioner, said the gasoline will be 83 octane. "The eyes of the industry are on this plant, and if it succeeds as the scientists think it will, the gas business in Texas will see a new day," he said.

An announcement in New York listed eight interests involved in the project for the purchase of units of $10,000 promissory notes. They are United Gas Corp., 100 units; Chicago Corp., 40; The Texas Co., 300; Forest Oil Corp., 100; Niagara Shares Corp., 100; Gulf States Oil Co., 30; Stone & Webster, Inc., 30; and La Gloria Corp., 100.

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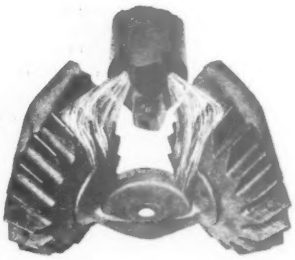

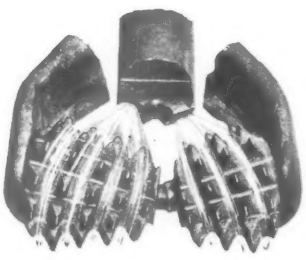

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# REFINING

## Lion's El Dorado Refinery To Add Catalytic Unit

EL DORADO, Ark. — A catalytic cracking unit of 4,500-bbl. daily capacity will be erected at the El Dorado refinery of Lion Oil Co. for the manufacture of high-octane gasoline, furnace oil and other products.

The new unit will embody latest developments, including simplified design, complete instrumentation and controls, corrosion protection, recycling for maximum yields, and will be suitable for operation on a wide range of charging stocks. An announcement said the company will continue to operate its other facilities for high-octane motor fuel, including the polymerization plant, naphtha reformer, and topping units for producing high-octane straightrun gasoline from select crudes. Components for 100-octane, such as codimer produced at Lion's refinery during the war, are being used to improve motor fuels.

## Ashland Plant Was Location For Record 343-Day Run

ASHLAND, Ky.—The record 343-day crude run of Ashland Oil & Refining Co. was made at the company's No. 1 refinery at Ashland, instead of at Toledo as reported in the February 9 issue of The Oil and Gas Journal. Ashland has no refinery at Toledo.

## Refinery Group Shifted To Broaden Experience

BATON ROUGE. — Assignments of a number of department heads and assistants in the refinery of the Louisiana division of Standard Oil Co. of New Jersey have been shifted in a newly inaugurated management program.

The plan is designed "to broaden the experience and capabilities of division and department heads and to improve the management of the company's diversified and constantly expanding operations," according to M. W. Boyer, vice president and general manager. Some of those assuming new duties will return eventually to their old positions, while others may be given new or additional assignments.

The recent changes follow:

J. P. Warner, manager of the chemical products division, given new position of assistant to the general manager to assist both Boyer and J. J. Voorhies, assistant general manager, in various activities of the manufacturing department.

H. G. Manglesdorf, head of the technical division, made manager of the chemical products division.

Charles Leet, assistant head of the technical division, made division head.

Dr. D. F. Edwards, head of process control operations, made assistant head of technical division.

D. O. Swan, in charge of light ends coordination, given the additional duties of head of refinery process control.

J. M. Jennings, superintendent of cracking operations, given new position as assistant process superintendent.

Fred Kring, Jr., general foreman of utilities division, made superintendent of cracking operations.

D. O. Wilkes, general foreman of butadiene and extraction operations, given new position of assistant head of maintenance and construction division.

N. F. Black, on special assignment in chemical products operations, made general foreman of butadiene and extraction department.

## Fischer-Tropsch Patents Available for Licensing

WASHINGTON. — A group of patents relating to the production of synthetic gasoline by the German Fischer - Tropsch process are now

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available for licensing, according to an announcement of James E. Markham, alien property custodian.

Licenses are available on a royalty-free, nonexclusive basis at a cost of a $15 administrative fee. A list may be obtained from the patent use and development section of the Alien Property Custodian's office.

## U. S. Makes 22 Patents Available to Industry

WASHINGTON.—Several processes applicable to the oil industry are included in the first group of 22 patents which the federal government is placing on the register of patents.

Application to use the patents on a nonexclusive, royalty-free basis should be addressed to the solicitor, Department of Interior, Washington 25, D.C. Among the titles of the 22 patents listed are preparation of cobalt-copper catalysts, water surveying apparatus, method and apparatus for separating and concentrating gases, apparatus for testing the embrittlement characteristics of solutions, and methods of protecting boilers and the like against embrittlement.

## Italy's Prewar Refineries Reduced to Single Plant

ROME. — Italy, whose refineries supplied 80 per cent of the national needs for petroleum products before the war, has only the plant at Bari left operating.

Little likelihood is seen that the other war-wrecked plants will be repaired in the immediate future, but officials are emphasizing the importance of restoring storage tanks. Prewar capacity of Italy's coastal refineries was about 1,900,000 metric tons, while other smaller plants could handle 950,000 tons.

## Two Australian Refineries Planned by New Company

SYDNEY. — Though Australia produces no oil of consequence, itself, two refineries designed to meet ultimately the country's needs in lubricating oil and bitumen are planned in New South Wales and in Victoria.

Australian Bitumen Refineries, Ltd., a new company partly financed by American interests, will operate the two plants, each of which will employ from 200 to 300 men. Lubricating oil, gasoline and a range of by-products as well as bitumen will be produced. First year's operation of the plants will require imports of 1,000,000 bbl. of crude, scheduled to come from Bahrein Island.

The Australian company was organized with a nominal capital of $6,396,400. An American company is to subscribe at par to 500,000 shares, while the remaining 750,000 will be offered for public subscription in various Australian states.

## Gulf Coast Gasoline Stocks Decrease to 1,021,424 Bbl.

HOUSTON. — Departing from the national pattern, automotive gasoline stocks in plants of the Gulf Coast Refiners Association decreased 78,637 bbl. during the last half of January.

Automotive gasoline stocks stood at 1,021,424 bbl. February 1. The total a year ago was 580,304 bbl. Stocks of all grades of gasoline and naphthas dropped 31,346 bbl. during the period and were reported at 1,835,158 bbl. February 1, against 1,768,836 bbl. a year ago.

All stocks dropped 54,471 bbl. to 3,432,440 bbl., compared with a normal prewar stock ranging around 5,000,000 bbl. Crude runs to stills totaled 103,858 bbl. daily which is 86.8 per cent of rated operating capacity.

## Sweden Gets New Refinery

STOCKHOLM.—A second Swedish refinery is now being built at Malmo by the shipping group which owns the present plant at Nynashamn. Construction of another refinery also is planned by the Swedish Cooperative Society, according to press reports.


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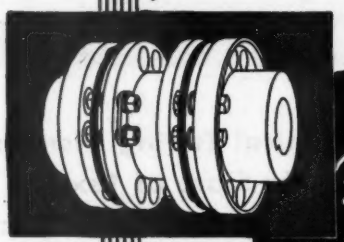
Flexible COUPLINGS
FOR HOT OIL PUMP DRIVES or any other service where 100% Operating Efficiency is demanded

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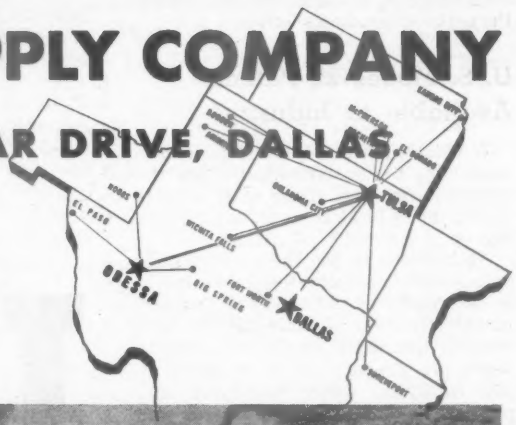


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# PIPE LINES

## Tenn. Gas & Transmission Wants $29,500,000 Program

WASHINGTON.—More natural gas to meet growing demands in eastern United States is in prospect with the filing of an application by Tennessee Gas & Transmission Co. for permission to spend $29,500,000 for capacity-raising improvements on its Texas-West Virginia line.

Tennessee Gas & Transmission is asking the Federal Power Commission to authorize construction of three new compressor stations and 410 miles of 26-in. main line loop as well as installation of 18 new compressor units in existing plants.

The application gives impetus to the natural gas conservation program. The company said the improvements will boost daily capacity of the carrier from 264,000,000 cu. ft. to 381,000,000 cu. ft. and that about three-fourths of the increase is to be supplied by gas now being wasted.

Construction work is set to commence May 1 with at least partial completion by the end of the year, the company said. Besides an "unprecedented demand" for gas in the Appalachian area, many small communities along the line are requesting service. The company added it now holds firm contracts for sale of 346,000,000 cu. ft. daily—90 per cent of the capacity of the carrier after completion of the new construction.

The new compressor stations will be built in Victoria and Montgomery counties, Texas, and Natchitoches Parish, Louisiana, with a total capacity of 25,000 hp. The 18 proposed new units have a total capacity of 19,000 hp.

Tennessee Gas & Transmission is negotiating for casinghead gas from Seeligson, Tom O'Connor, Heyser, and Katy fields where production of waste gas approximates 87,000,000 cu. ft. daily. Other contracts, the company added, provide reserves in Agua Dulce, Riverside-O'Neel, Ragsdale, Placedo, Nada, Orange Hill, Lissie, East Bernard, Josey Ranch, and Sarco Creek fields.


WHEN YOU WANT The Best IN PIPELINE CONSTRUCTION

OKLAHOMA CONTRACTING COMPANY

DALLAS TEXAS

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X-L LINE PIPE COUPLINGS

Our special process of recessing "X-L" Line Pipe Couplings assures perfect alignment, tighter joints and protection of vanishing threads giving longer life to the line. Made in strict accordance with A.P.I. standards in all sizes, black or galvanized. Tested by Comparator to insure maximum accuracy.

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WHEELING MACHINE PRODUCTS COMPANY
WHEELING, WEST VA.


## North Texas Crude Runs Show Slight Increase

WICHITA FALLS.—Crude oil runs from North Texas pools averaged 123,044 bbl. daily in the week ending February 2, a gain of 291 bbl. over the previous week. Of the 14 counties included in the report, Wichita County stood high with daily runs of 36,009 during the week as compared to 35,759 in the previous week.

## Kansas-Nebraska Nat. Gas Presents $1,515,000 Proposal

CHICAGO. — An application of Kansas-Nebraska Natural Gas. Co. for $1,575,000 additional pipe line facilities is to be considered by the Federal Power Commission in hearings here this week.

The company is asking permission to build and operate 77 miles of 16 and 12¾ in. line from Phillipsburg, Kans., to near Hastings, Neb., about 100 miles of branch lines to various Nebraska communities, replacement of 56 miles of its present system with smaller diameter pipe, purchase of about 36 miles of branch lines in Nebraska from Central Electric and Gas Co., and the installations of additional compressor units. FPC also is requested by the company to approve permanent operation of 9 miles of war


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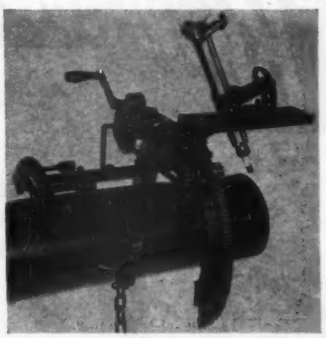

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**SPEED:** Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.

**ECONOMY:** Save approximately one-half labor and gas costs.

**PORTABILITY:** Can easily be carried from one pipe section to another.

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PIPELINE "Know-how"

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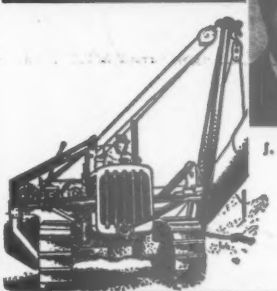
Partner



PIPE LINE COMPRESSORS DITCHERS DOZERS
CONSTRUCTION WELDERS TRUCKS TRACTORS

SMITH CONTRACTING COMPANY
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FORT WORTH NATIONAL BANK BLDG.
FORT WORTH 2, TEXAS

built line from McCook, Neb., to the McCook airfield.

## FPC Approval Sought for Hugoton-Kansas City Line

WICHITA.—Permission to build a $25,620,000 natural-gas pipe line from the Hugoton field to Kansas City is being requested of the Federal Power Commission by Mid-Continent Gas Transportation Co.

The proposed line would reach from a point near Liberal to connections in Wichita and Kansas City. Wichita city officials have received a copy of an application signed by William D. Weidlein, St. Paul, president, which the company is presenting to FPC.

The company is hoping to begin construction not later than June 1 with completion in 6 months, providing FPC acts favorably on its request. It proposes to serve natural-gas distribution companies and industrial concerns for 5 years.

## SPA Mails 5,000 Letters To Big Inch Prospects

WASHINGTON. — The Surplus Property Administration which believes the War Emergency Pipelines can best be operated as petroleum carriers has written more than 5,000 oil operators asking for expressions of interest in purchase or lease of the properties or their operation as common carriers.

F. E. Berquist, vice president of the plant disposal division of SPA, requested replies in 10 days. He asked for at least a general statement of terms and conditions from those wishing to purchase or lease the lines "either individually or in combination with others" and the "nature and extent" of the interest of those who desire their operation as desiring to use the lines as part owners or non-owning shippers. Replies, he added, will be held confidential.

The poll of the industry was undertaken after a 30-day extension of time for study of SPA's disposal recommendations was granted by a resolution introduced in the Senate by Sen. Burnet R. Maybank. Overriding recommendations of the Reconstruction Finance Corp. that the two government carriers be converted to natural gas, SPA report recommending operation for petroleum transportation would have become the policy of Congress had no adverse action been taken before the original February 15 deadline.

Four smaller pipe lines owned by the government have been given relatively little attention in the discussions over the more important Big and Little Big Inch properties. These carriers, SPA said in its report, "present few or no problems from a policy standpoint. There is reasonable prospect of finding some economic use for each of them in its present location."

These lines consist of 154 miles from Refugio, Tex., to Houston, 200 miles across northern Florida, 179 miles from Greensboro, N. C., to Richmond, Va., and 82 miles from Tiffin to Doylestown, Ohio.

## Simmons, Randels Named Interstate Superintendents

Sid R. Simmons and George B. Randels have been named general superintendents of the southern division and the northern division respectively of the Interstate Oil Pipe Line Co.

Simmons succeeds John A. Kunkle who became special pipe line adviser for the southern division. Sam A. Sheppard, a district foreman, took Simmons' former post as assistant general superintendent.

In Interstate's northern division, James B. Bradley was appointed assistant manager. Randels, the new general superintendent, was recently separated from the Army after service as a major in India in the 12th Engineering District which had charge of pipe line operation, barge and tank loading.

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No other pipe approaches Saran in its practical advantages for the petroleum industry . . . It meets all standard pipe specifications—yet, weighs only ¼ as much as iron pipe. Saran, unaffected by heat up to 175°, is tough and flexible, non corrosive —and highly resistant to abrasion, chemicals and high pressures. Installation is simplicity itself. Lengths of Saran are quickly fused together by hot plate welding—or threaded to standard fittings. Available sizes: ½ to 4 inches I.P.S. *Write today for full information . . . Let Acadia engineers suggest possible uses.*

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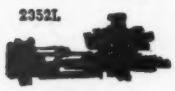
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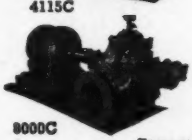
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INDIANAPOLIS IND.

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# STATISTICS and

## WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 16, 1946

| | Total of all wells | | | | | Cum. to date | | Wildcat completions and discoveries | | | | | Cumulative total, 1946 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Comp. | Oil | Gas | Dry | Footage | 1946 | 1945 | Oil | Dist. | Gas | Dry | Total | Oil | Dist. | Gas | Dry | Total |
| New York | 27 | 14 | 0 | *13 | 48,269 | 197 | 173 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pennsylvania | 63 | 34 | 3 | †26 | 101,222 | 592 | 429 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| West Virginia | 11 | 1 | 7 | 3 | 31,947 | 76 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ohio | 21 | 5 | 11 | 5 | 46,548 | 137 | 90 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 5 | 10 |
| Indiana | 3 | 3 | 0 | 0 | 6,198 | 38 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 |
| Kentucky | 4 | 2 | 0 | 2 | 8,335 | 57 | 52 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 8 | 9 |
| Illinois | 38 | 25 | 0 | ‡13 | 98,981 | 254 | 244 | 0 | 0 | 0 | 6 | 6 | 4 | 0 | 0 | 49 | 53 |
| Michigan | 17 | 4 | 1 | 12 | 39,457 | 88 | 96 | 0 | 0 | 0 | 7 | 7 | 1 | 0 | 0 | 31 | 32 |
| Kansas | 37 | 18 | 4 | 15 | 119,763 | 293 | 187 | 0 | 0 | 0 | 5 | 5 | 2 | 0 | 1 | 39 | 42 |
| Neb., Mo., Iowa | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Oklahoma | 50 | 27 | 6 | 17 | 190,912 | 314 | 310 | 2 | 0 | 2 | 4 | 8 | 9 | 0 | 4 | 48 | 61 |
| Texas | 120 | 70 | 10 | 40 | 563,995 | 1,009 | 898 | 4 | 0 | 1 | 21 | 26 | 17 | 0 | 5 | 155 | 177 |
| North Central | 35 | 20 | 0 | 15 | 100,676 | 346 | 260 | 1 | 0 | 0 | 6 | 7 | 5 | 0 | 0 | 53 | 58 |
| West | 26 | 19 | 1 | 6 | 137,680 | 213 | 228 | 1 | 0 | 0 | 3 | 4 | 6 | 0 | 0 | 22 | 28 |
| Panhandle | 5 | 3 | 0 | 2 | 15,013 | 50 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| Eastern | 14 | 7 | 4 | 3 | 88,539 | 95 | 39 | 0 | 0 | 1 | 3 | 4 | 1 | 0 | 1 | 19 | 21 |
| Gulf Coast | 32 | 17 | 5 | 10 | 195,399 | 248 | 217 | 1 | 0 | 0 | 6 | 7 | 3 | 0 | 2 | 42 | 47 |
| Southwest | 8 | 4 | 0 | 4 | 27,688 | 57 | 79 | 1 | 0 | 0 | 3 | 4 | 2 | 0 | 2 | 17 | 21 |
| Louisiana | 25 | 15 | 2 | 8 | 170,116 | 152 | 118 | 2 | 0 | 0 | 4 | 6 | 10 | 1 | 0 | 17 | 28 |
| Northern | 13 | 7 | 2 | 4 | 53,157 | 79 | 35 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 12 | 14 |
| Southern | 12 | 8 | 0 | 4 | 116,959 | 73 | 83 | 2 | 0 | 0 | 2 | 4 | 8 | 1 | 0 | 5 | 14 |
| Arkansas | 4 | 2 | 0 | 2 | 16,181 | 21 | 23 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 2 | 3 |
| Mississippi | 2 | 2 | 0 | 0 | 16,716 | 30 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 |
| Southeastern States | 0 | 0 | 0 | 0 | 0 | 8 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 |
| Montana | 2 | 2 | 0 | 0 | 2,871 | 32 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Wyoming | 4 | 2 | 0 | 2 | 18,057 | 23 | 29 | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 2 | 10 | 13 |
| Colorado | 3 | 2 | 0 | 1 | 17,105 | 15 | 5 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 3 |
| New Mexico | 5 | 4 | 0 | 1 | 17,139 | 56 | 66 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 6 | 7 |
| California | 35 | 29 | 2 | 4 | 135,440 | 246 | 310 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 1 | 27 | 30 |
| Utah | 1 | 1 | 0 | 0 | 1,215 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| Total United States | 472 | 262 | 46 | 164 | 1,650,467 | 3,640 | 3,218 | 10 | 0 | 3 | 55 | 68 | 51 | 1 | 17 | 421 | 490 |
| Total previous week | 507 | 281 | 60 | 166 | 1,628,853 | 3,168 | 2,752 | 10 | 0 | 1 | 57 | 68 | 41 | 1 | 14 | 366 | 422 |
| Total Feb. 17, 1945 | 466 | 258 | 47 | 161 | 1,702,958 | 3,218 | 2,419 | 13 | 1 | 5 | 63 | 82 | 73 | 1 | 22 | 443 | 539 |

Service wells included: *12, †26, ‡1.

## MARKET QUOTATIONS

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

### REFINERY GASOLINE

| | | |
|---|---|---|
| Octane (A.S.T.M.) | 78-80† | 73-75 |
| Mid-Continent* | 6.125-6.375 | 5.375-5.75 |
| Gulf Coast | 6.75 | 5.75-6.50 |
| New York Area | | 7.425-7.90 |
| California | | 6.50-7.00 |

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

### NATURAL GASOLINE

| Grades: | 26-70 | 18-55 |
|---|---|---|
| Oklahoma (Group 3) | 3.000 | 3.600 |
| N. Texas (f.o.b. plant) | 2.750 | 3.330 |
| N. Louisiana (f.o.b. plant) | 3.125 | 3.750 |
| California | 4.875 | 5.500 |

### CRUDE-OIL PRICES

| Representative posted schedules per bbl. | |
|---|---|
| East Texas | $1.25 |
| Conroe | 1.43 |
| Tepetate, Louisiana, avg. grav. | 1.20 |
| Illinois Basin | 1.37 |
| Pecos County, Texas | .95 |
| Bradford, Pennsylvania | 3.00 |
| Van, Van Zandt County, Texas | 1.08 |

Note: Exclusive of subsidy.

### GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

| Gravity— | Signal Hill, Calif. | Oklahoma, Kansas | Gulf Coast Texas | West Tex.* |
|---|---|---|---|---|
| 18-18.9 | $0.80 | .... | .... | .... |
| 19-19.9 | .84 | .... | $1.06 | $0.70 |
| 20-20.9 | .88 | $0.85 | 1.06 | .72 |
| 21-21.9 | .92 | .87 | 1.10 | .74 |
| 22-22.9 | .96 | .89 | 1.12 | .76 |
| 23-23.9 | 1.00 | .91 | 1.14 | .78 |
| 24-24.9 | 1.03 | .93 | 1.16 | .80 |
| 25-25.9 | 1.07 | .95 | 1.18 | .82 |
| 26-26.9 | 1.11 | .97 | 1.20 | .84 |
| 27-27.9 | 1.15 | .99 | 1.22 | .86 |
| 28-28.9 | 1.18 | 1.01 | 1.24 | .88 |
| 29-29.9 | 1.20 | 1.03 | 1.26 | .90 |
| 30-30.9 | 1.23 | 1.05 | 1.28 | .92 |
| 31-31.9 | .... | 1.07 | 1.30 | .94 |
| 32-32.9 | .... | 1.09 | 1.32 | .96 |
| 33-33.9 | .... | 1.11 | 1.34 | .98 |
| 34-34.9 | .... | 1.13 | 1.36 | 1.00 |
| 35-35.9 | .... | 1.15 | 1.38 | 1.02 |
| 36-36.9 | .... | 1.17 | 1.40 | 1.04 |
| 37-37.9 | .... | 1.19 | 1.42 | 1.06 |
| 38-38.9 | .... | 1.21 | 1.44 | 1.08 |
| 39-39.9 | .... | 1.23 | 1.46 | 1.10 |
| 40 and above | .... | 1.25 | 1.48 | 1.12 |

*Includes Lea County, New Mexico.

### A.P.I. REFINERY REPORT

Week ended February 9, 1946
(Figures in thousands of barrels)

| | Dly. crude runs to stills | Stocks: Gasoline | Distillate | Residual |
|---|---|---|---|---|
| East Coast | 752 | 22,988 | 8,242 | 5,923 |
| Appalachian | 146 | 4,183 | 552 | 548 |
| Ill., Ind., Ky. | 695 | 22,594 | 3,654 | 2,905 |
| Okla., Kan., Mo. | 377 | 9,718 | 1,428 | 1,024 |
| Inland Texas | 210 | 3,130 | 280 | 678 |
| Tex. Gulf Cst. | 1,098 | 16,383 | 4,989 | 4,408 |
| La. Gulf Cst. | 297 | 4,993 | 1,787 | 1,248 |
| N. La., Ark. | 59 | 1,338 | 1,067 | 236 |
| Rocky Mtn. | 109 | 2,197 | 398 | 725 |
| California | 769 | 15,795 | 6,537 | 21,860 |
| Total 2- 9-46 | 4,512 | 103,319 | 28,934 | 39,555 |
| Total 2- 2-46 | 4,530* | 103,125 | 28,939 | 39,086 |
| Total 2-10-45 | 4,820 | 93,355 | 29,471 | 48,676 |

*On new basis in East Coast district.

### CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

| Week ended: | Bbl. of crude* |
|---|---|
| February 9, 1946 | 223,303,000 |
| February 2, 1946 | 224,351,000 |
| February 10, 1945 | 218,894,000 |

*Excludes unrefinable Calif. stocks.

# TRENDS

## DAILY AVERAGE PRODUCTION FOR WEEK

| | Feb. 16 crude oil | Bureau of Mines demand forecast | Feb. 9 crude oil |
|---|---|---|---|
| Alabama | 1,000 | 500 | 950 |
| Arkansas | 77,500 | 74,000 | 77,300 |
| California | 842,300 | 844,000 | 846,350 |
| Colorado | 22,620 | 24,000 | 22,630 |
| Eastern | 61,250 | 61,200 | 63,500 |
| Florida | 100 | 100 | 100 |
| Illinois | 207,150 | 198,000 | 212,600 |
| Indiana | 16,200 | 13,000 | 16,500 |
| Kansas | 259,650 | 254,000 | 236,700 |
| Kentucky | 30,050 | 29,000 | 32,000 |
| Louisiana | 367,900 | 368,000 | 368,300 |
| North Louisiana | 79,200 | ..... | 79,650 |
| South Louisiana | 288,700 | ..... | 288,650 |
| Michigan | 42,100 | 46,000 | 44,280 |
| Mississippi | 55,100 | 49,000 | 55,200 |
| Montana | 21,640 | 20,400 | 21,640 |
| Nebraska | 750 | 800 | 750 |
| New Mexico | 98,250 | 96,000 | 98,000 |
| Oklahoma | 389,450 | 368,000 | 389,100 |
| Texas | 2,110,000 | 1,890,000 | 2,109,250 |
| East Texas | 321,300 | ..... | 321,000 |
| East Central Texas | 146,150 | ..... | 146,200 |
| North Central Texas | 157,650 | ..... | 157,600 |
| Texas Panhandle | 81,100 | ..... | 81,000 |
| West Texas | 503,400 | ..... | 503,300 |
| Southwest Texas | 356,300 | ..... | 356,150 |
| Texas Gulf Coast | 544,100 | ..... | 544,000 |
| Wyoming | 91,330 | 94,000 | 87,850 |
| Total United States | 4,694,340 | 4,430,000 | 4,683,000 |

Change from prev. week, up 11,340

Total production Jan. 1-Feb. 16 ..... 225,514,660 bbl.

Same period last year ..... 222,027,550 bbl.

**CRUDE-OIL STOCKS** 223,303,000 bbl. as of Feb. 9—down 1,048,000 bbl. One year ago 218,894,000 bbl.

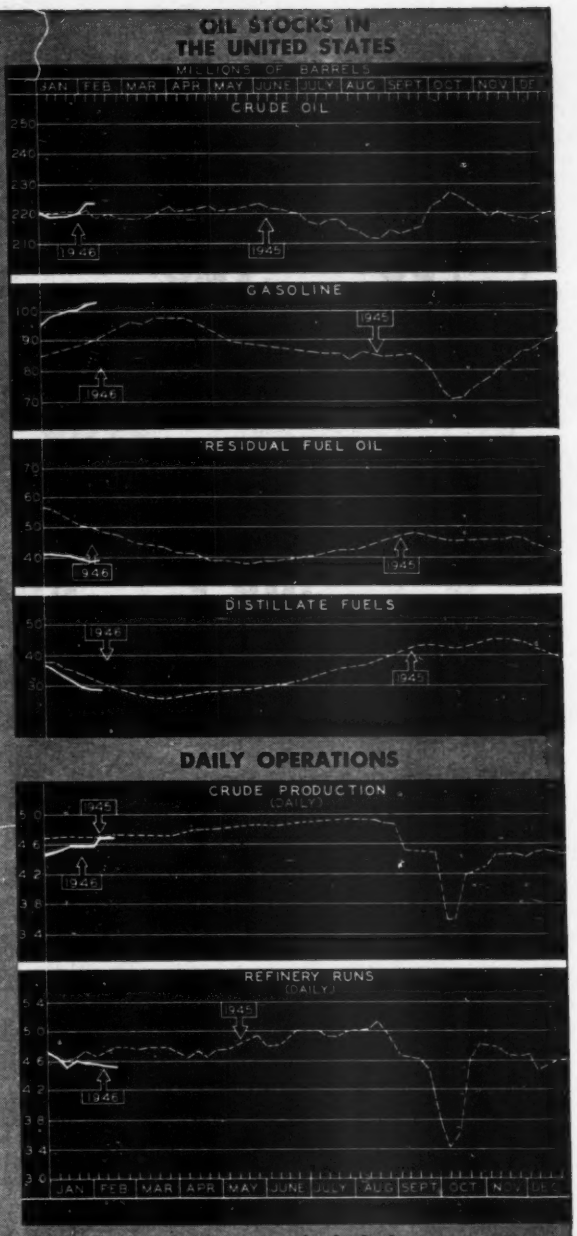
**GASOLINE STOCKS** 103,319,000 bbl. as of Feb. 9—up 194,000 bbl. One year ago 93,355,000 bbl.

**RESIDUAL FUEL-OIL STOCKS** 39,555,000 bbl. as of Feb. 9—up 469,000 bbl. One year ago 48,676,000 bbl.

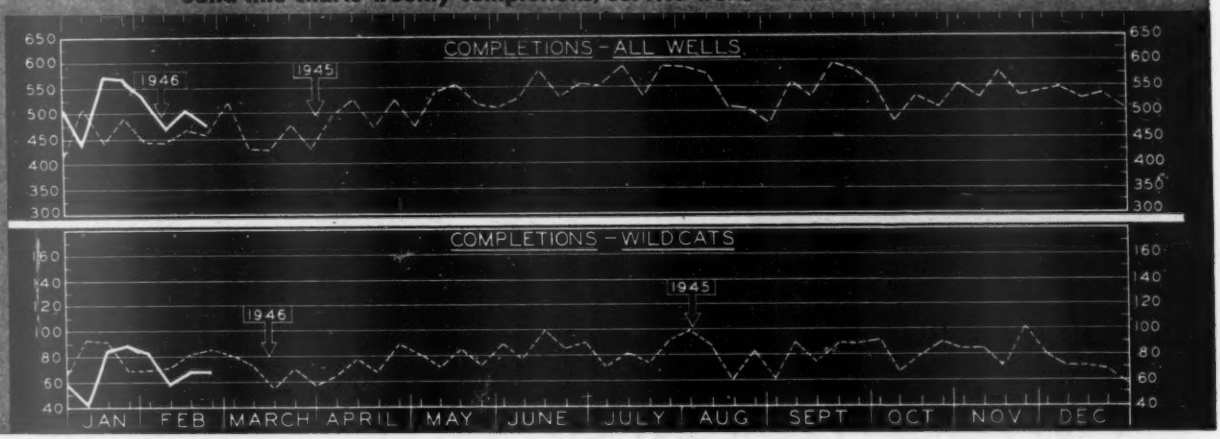
**GAS OIL AND DISTILLATE STOCKS** 28,934,000 bbl. as of Feb. 9—down 5,000 bbl. One year ago 29,471,000 bbl.

**CRUDE-OIL PRODUCTION** 4,694,340 bbl. as of Feb. 16—up 11,340 bbl. One year ago 4,769,000 bbl.

**REFINERY RUNS** 4,512,000 bbl. daily week ended Feb. 9—down 18,000 bbl. One year ago 4,820,000 bbl.




**Solid line charts weekly completions, service wells in Eastern area included**



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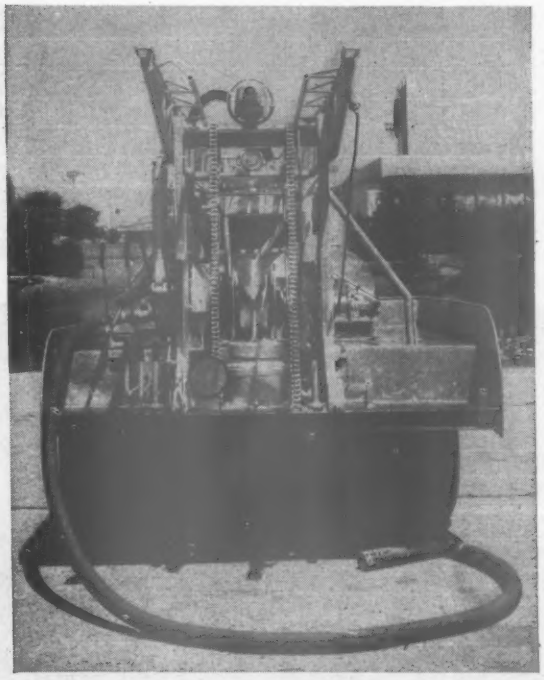

Rear view of mobile Seismograph Drill made by Mayhew Machine & Engineering Works, Dallas. Mast is down for traveling.

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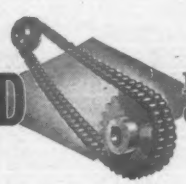

**DIAMOND ROLLER CHAINS**

# Exploration and Drilling

## Hatteras Test Gets Marine Section

ON THE basis of paleontologist's checking of samples and cores, it is reported that the wildcat being drilled near Cape Hatteras Lighthouse by Carter Oil Co. for Standard Oil Co. (N. J.), is drilling in Cretaceous formations that are definitely marine in origin. In fact, with the exception of a few fingerings of continental deposits in the Tertiary, all the sediments penetrated have been marine in character.

This test, known as 1 Hatteras Light, is located about 1,700 ft. southwest of the old Hatteras Lighthouse, with exact location given as longitude 75° 30′ 56″, latitude 35° 15′ 14″. Elevations 6.82 ft. for ground, and 24.8 ft. for the derrick floor.

Latest available reports are that drilling is proceeding below 4,519 ft., with a 9⅞-in. bit, with cores being taken at 100-ft. intervals. The well was drilled to 4,406 ft. with a 9⅞-in. bit, then reamed to bottom with a 13¾-in. bit, but when an attempt was made to run the 10-in. casing, it would not go below 1,800 ft. Preparations are being made to ream to total depth with a 15-in. bit. Electric logging and cementing equipment have been moved to the site by barge. All heavy equipment is moved by this method.

On the basis of the section encountered to date, the best geological estimate is that granite will be encountered at about 8,000 ft. While equivalents are difficult to correlate, the well is not believed to be low enough in the Cretaceous as yet to catch either the Eutaw or the Tuscaloosa, both of which produce oil in Mississippi and elsewhere.

In view of the agitation in Washington about title to offshore lands on the continental shelf beyond the tidal low-water mark, it is interesting to note that this test is about as far east into the Atlantic as it is possible to get on dry land south of New York. Considering the general southwest regional strike of the Appalachian Mountains, and the distance from the mountains to the coastline, the location is about the farthest north that a good test can be made and still get a substantial distance eastward from the mountains.

Reports are that regardless of the outcome of this particular test, a wildcat program of perhaps as many as eight wells on large blocks in this general area has been planned.

## SOUTHWEST TEXAS

### New Pay Zone Opened In La Reforma Field

CORPUS CHRISTI.—A new pay discovery at La Reforma field, Starr County, Baldridge & King 1 A. Guerra Estate, flowed a potential of 146 bbl. per day through a ¼-in. choke, with gas-oil ratio 612 to 1, and tubing pressure 940 lb., casing pressure 1,020 lb. Gravity 42°, with no water in the flow.

Richardson Petroleum Co. 1 L. G. Tolbert, in Saxet field, Nueces County, is testing new sand for the field through perforations at 6,643-45 ft. after making a squeeze job at 6,637-63 ft. Total depth is 7,492 ft., with 5½-in. casing set at 7,492 ft. On a drill-stem test at 6,641-53 ft. prior to setting casing, this test had recovered 6,400 ft. of oil in 15 minutes with 60 lb. working pressure.

The opening of a new oil field for Goliad County, or either a 2-mile northeast extension to the South Cabeza Creek field, is indicated in Jay Simmons 1 Mary Poehler, wildcat, which is ready for a production test through perforations in the second zone of the massive Wilcox, topped with oil saturation at 8,279 ft. Total depth is 8,287 ft. with 5-in. casing on bottom. This well is located in Jacob Fifer Survey, Tract 6, 6 miles southwest of Weesatche. Previously it had shown gas-condensate on a drill-stem test made at 8,000-10 ft.

Seven wildcats were reported as locations this week, two in Jim Hogg, one each in Bexar, Brooks, Dimmit, Edwards, and Willacy counties. There were 29 new starts reported. Of the 28 completions, 8 are wildcats, 1 a new oil pay in Starr County, 7 dry holes, 1 each in DeWitt, Duval, Kleberg, Live Oak, Nueces, Travis, and Webb counties. Five completions were reported in Kleberg County.

**SOUTHWEST TEXAS SUCCESSFUL WILDCAT**

Starr County: New oil pay, LaReforma field—Baldridge & King 1 A. Guerra Estate, San Jose Grant, 2 mi. S of LaReforma, top sand 6,113 ft., TD 6,150 ft., perf. 6,145-48 ft., PT 146 bbl. per day through ⅛-in. choke, gas-oil ratio 612 to 1, tubing pressure 940 lb., casing pressure 1,020 lb., gravity 42°, no water.

**SOUTHWEST TEXAS WILDCAT FAILURES**

DeWitt County: Amerada Petr. Corp. et al 1 F. C. Dreier et al, James Turner Sur., 6 mi. S of Meyersville, dry at 9,123 ft.

Duval County: Southern Minerals Corp. 1 Juan Benavides, El Mesquite Grant, dry at 3,371 ft.

Kleberg County: Fred M. Wood 1 Annie M. East, Farm Lot 8, Sec. 34, Kleberg Town & Improvement Co. Subdivision, 5 mi. SE of Kingsville, dry at 8,251 ft.

Live Oak County: Sid Katz 1 Leonard Jacob Estate, 10 mi. S from Whitsett, Louis Ayara Survey, Abst. 2, Sec. 15, dry at 1,383 ft.

Nueces County: Santa Clara Oil and Maguire Industries, Inc. 1 Nina G. Stewart, Mariano Lopez de Herrera Grant, 3 mi. W of Calallen, dry at 7,515 ft.

Travis County: Morris & Connally 1 L. Lundgren, L. Kimbro Sur. 64, 7 mi. NE of Manor, dry at 900 ft.

Webb County: George K. Taggart 1 Lod Maglia, Sec. 723, 13 mi. N of Bruni, dry at 2,746 ft.

## EASTERN TEXAS

### Travis Peak Production In Whelan Pool Extended

DALLAS.—Placid Oil Co. 1 Knox, Parker Survey, has extended Travis Peak gas-distillate production 1 mile south of the discovery well in the Whelan pool of western Harrison County. It was making an estimated 2,500,000 cu. ft. of gas and 24 bbl. of distillate daily. Production is through perforations from 7,418-8,084 ft. Total depth is 8,300 ft. R. W. Williams 1 Furrh estate, Francis O'Neal Survey, indicating a new Travis Peak oil pool 3 miles northwest of Elysian Field in southeastern Harrison County, was still testing the Travis Peak. The well made 15 bbl. of 42°-gravity oil in an unreported length of time through perforations from 6,294-6,308 ft. Total depth is 6,850 ft.

Humble Oil & Refining Co. 1 Pickering, Francois Survey, wildcat in the Huxley area of eastern Shelby County, recovered slightly gas-cut drilling mud on a drill-stem test from 8,196-8,212 ft. Another test will be run. Tex-Harvey Oil Co. 1 Reitch, Weir Survey, Cherokee County wildcat 10 miles northeast of Rusk, ran a drill-stem test from 2,965-3,010 ft. in the Navarro and recovered 90 ft. of mud with no shows. Navarro was topped at 2,892 ft. It was drilling below 3,500 ft.

Delta Drilling Co. 1 Livingston, Nacogdoches University Survey, wildcat 3 miles southeast of Reilly Springs in southern Hopkins County, is reported to be a failure at 8,630 ft. in the Travis Peak. The wildcat had water in the Travis Peak, the Young from 8,155-65 ft., Gloyd from 8,005-32 ft., and the sub-Clarksville from 4,005-10 ft.

Hawkins field, Wood County, reported five completions this week and Carthage field, Panola County, three. Hawkins field had 11 locations. Hawkins field has 28 drilling wells; Carthage field, 25; Pickton field, Hopkins County, 6 and New Hope field, Franklin County, and Waskom field, Harrison County, each 5.

**EASTERN TEXAS SUCCESSFUL WILDCAT**

Marion County: New gas field—Lacy and Allied Oil Co. 1 Scott, Alexander Johnson Sur., 2½ mi. SW Jefferson, flowed 1,640,000 cu. ft. gas open flow, perf. 5,904-14 ft. Hill, TD 7,530 ft.

**EASTERN TEXAS WILDCAT FAILURES**

Cherokee County: Clark & Cowden 1 E. M. Decker et al, C. G. Woods Sur., 7½ mi.

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W Alto, Austin 4,980 ft., Woodbine 5,180 ft., dry at 5,400 ft.

Kaufman County: Bobby Manziel 1 Williamson, J. S. Ables Sur., Kemp townsite, elev. 371 ft., Woodbine 2,979 ft., dry at 3,014 ft.

Smith County: Phillips 1 Englander, Thomas Quevado Sur., S. Tyler pool, elev. 567 ft., Travis Peak 10,365 ft., dry at 13,981 ft.

# N. CENTRAL TEXAS

## Archer County Wildcat Has Oil Show in Lime

WICHITA FALLS.—H. W. Snowden 1 Morrison, Block 1823, TE&L Survey, wildcat 7 miles northeast of Olney, Archer County, topped the Caddo at 4,495 ft., and drilled lime showing oil from 4,495-4,575 ft., and from 4,606-30 ft. Mississippian was topped at 5,220 ft. There were slight oil stains from 5,220-36 ft. On a 20-minute drill-stem test of the section 200 ft. of oil-cut mud was recovered.

Cities Service Oil Co. will drill a 6,500-ft. wildcat in Knox County to test the Ellenburger. It is 1 Mrs. Doris Mulkey in Section 162, Block 44, H&TC Survey. The test will be located 2 miles south of Truscott. Denver Producing & Refining Co. 1 Jewell, Section 15, William Allen Survey, wildcat 6 miles southeast of Gordonville, Grayson County, was drilling below 8,860 ft. in lime and shale.

Standard Oil Co. of Texas 2 Beasley, J. McKerley Survey, deep test in the Sivells Bend pool of northern Cooke County, ran a drill-stem test from 9,070-9,164 ft. Tool was open 22 hours and 18 minutes. Recovery was 1,260 ft. of drilling fluid, 6,300 ft. of slightly oil-cut drilling fluid and 270 ft. of salt water. Casing was perforated from 9,050-59 ft. with 30 shots and it was swabbing oil-cut mud through perforations. Standard of Texas 3 Beasley in the same area flowed 89.66 bbl. of oil in 8 hours through 22/64-in. choke and died. Operator was testing further.

Electra field, Wichita County, reported seven completions this week, Holliday field, Archer County five, and KMA field, Wichita County, three. Archer and Wichita counties each had seven field locations and Cooke County had six. Sivells Bend field, Cooke County, had eight drilling wells, Cooper field, Archer County, Nocona, Hildreth and Bowers fields, Montague County, each had six and National field, Wilbarger County, Lupton and Knox fields, Young County, each has five.

### NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Young County: New oil pool—Hanlon-Buchanan and Ben Rankin 1 Mrs. M. Logan et al, Sec. 3, J. Poitevent Sur. A-228, 5 mi. W Bryson, elev. 1,227 ft., flowed 81 bbl. day through 14/64-in. choke, perf. 4,109-14 ft., Caddo, gravity 41°, gas-oil ratio 1,700 to 1, TD 4,014 ft.

### NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: S. F. Hutcheson 1 fee, J. W. Harris Subd., Lot 142, 3½ mi. NE Archer City, dry at 2,275 ft.

McMahon, Kelleher & McMahon 1 J. H. Turbeville, Harris Subd. Club Ranch, 5½ mi. NW Archer City, dry at 1,516 ft.

Throckmorton County: Grisham & Hunter 12-D Kelley, Sec. 2, J. Bell Sur., 8 mi. SW Throckmorton, elev. 1,323 ft., Mississippian 4,675 ft., dry at 4,709 ft.

### WEST CENTRAL TEXAS

ABILENE.—Allied Oil Co. 1 L. A. Sanders, TE&L Survey No. 583, Schackelford County wildcat discovery, filled up and flowed in 18 hours from the Ellenburger at 4,534-35 ft. The well flowed six heads of oil in 3 hours while casing was being run to 4,529 ft. Operator is erecting storage and connections in preparation for completion. Ashland Oil & Refining Co. 1 Lee, Block 1744, TE&L Survey, prospective Ellenburger discovery 4 miles northwest of Graford, Palo Pinto County, was treated with 500 gal. of acid from 5,038-46 ft., the total depth. Ellenburger was topped at 5,023 ft. The hole had filled 1,600 ft. with fluid in 4 hours and 5½-in. casing was set at 5,380 ft., Continental Oil Co. has staked a 6,000-ft. rotary test 1 mile south of Poolville in Parker County. It is 1 C. P. Woody, 660 ft. from the north and west lines of the D. A. Deal Survey, Abstract 2,104.

There were no field completions this week in this district. Jones County Regular, Shackelford County Regular and Stephens County Regular fields each reported one location. Stephens County has 16 drilling wells, 6 in Stephens County Regular field and 3 in Loving field and 7 wildcats. Jones County has 15, 1 each in Jones County Regular field, Noodle field and Cooper field, and 12 wildcats.

### WEST CENTRAL TEXAS WILDCAT FAILURES

Jones County: H. L. Hunt 1 Braum, Sec. 193, BBB&C Sur., 2 mi. N Avoca, elev. 1,531 ft., dry at 3,385 ft.

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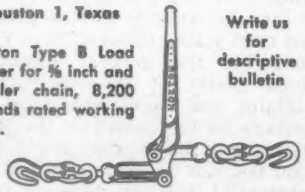

Write us for descriptive bulletin

Shackelford County: Eltex, Ltd., 2 Merrick Davis, Sec. 16, Blk. 12, T&P Sur., 7 mi. SW Albany, elev. 1,878 ft., Ellenburger 5,113 ft., Cambrian 5,602 ft., dry at 5,812 ft.

Stephens County: Panhandle Oil & Refg. 1 Oma Repass, Sec. 1066, TE&L Sur., 1½ mi. SE Ivan, elev. 1,090 ft., Ellenburger 4,410 ft., dry, at 4,506 ft.

# PERMIAN BASIN

## Location Staked for Deep Test in Ector County

MIDLAND.—The Texas Co. will drill a 10,000-ft. wildcat in western Ector County. It is 1-F George C. Fraser, 1,980 ft. from the south line and 660 ft. from the west line of Section 39, Block 45, T-1-N, T&P Survey. The test is 2¼ miles north of Ellenburger production in the TXL area and 3 miles southwest of the Cummings pool. Texas 29, Section 9, Block B-16, Public School Land Survey, wildcat 2 miles west of the Penwell field, southern Ector County, having failed to show for commercial production on several tests since finding water in the Ellenburger, will attempt completion in the San Andres zone, corresponding to the Penwell pay level. Horizon from 3,442-3,600 ft., which showed gas in 35 minutes on a drill-stem test and recovered 60 ft. of sweet oil, will be tested. Total depth is 9,675 ft.

Humble Oil & Refining Co. 1 Doss, Section 1, Block A-24, Public School Land Survey, 1-mile north outpost to the east side of the Doss pool in southern Gaines County, ran a 2-hour drill-stem test from 7,075-7,150 ft. and recovered 2,200 ft. of drilling mud and 540 ft. of oil and gas-cut mud. Operator was preparing to run another drill-stem test from 7,165-81 ft. Second producer for the Tankersley pool of southeastern Irion County has been assured at the Shell Oil Co., Inc. 3 Tankersley, Section 10, GC&SF Survey, ½ mile north of the discovery well. During the last 16 hours of a 24-hour swabbing test, 142 bbl. of oil and 17 bbl. of basic sediment and water was recovered.

Gulf Oil Corp. 1-Z University, Andrews County test 2½ miles south of the nearest Clear Fork production in the triple-pay Fullerton field, indicated 185 ft. of pay in the Tubb zone of the Clear Fork. On a 1-hour drill-stem test of the Tubb from 6,822-6,930 ft., 5,000 ft. of clean oil was recovered. It drilled to 7,080 ft. and recovered 50 ft. of free oil, 90 ft. of bottom-hole water and 90 ft. of drilling mud on a drill-stem test from 7,005-80 ft. It was drilling below 7,080 ft.

TXL field, Ector County, and Keystone-Ellenburger field, Winkler County, each reported three completions this week and Iatan E. Howard, Howard County, and Fullerton field, Andrews County, each two. McElroy field, Crane and Upton counties, had four locations and Fullerton field, and North Ward Estes field, Ward and Winkler counties, each had three. TXL field has 38 drilling wells; Keystone-Ellenburger field has 37; Block 31 field, Crane County, has 20; Fullerton field has 26 and Welch field, Dawson County, has 11.

### WEST TEXAS SUCCESSFUL WILDCAT

Howard County: New oil pay—Continental 1-D-133 Settles, Sec. 133, Blk. 29, W&NW Sur., Howard-Glasscock pool, elev. 2,696 ft., pumped 30 bbl. day, perf. 8,910-9,100 ft. Strawn, gravity 40.6°, TD 10,122 ft.

### WEST TEXAS WILDCAT FAILURES

Andrews County: DeKalb 1 W. E. Jones, Sec. 15, Blk. A-40, PSL Sur., ¼ mi. E New Mexico state line, elev. 3,349 ft., Tubb 6,450 ft., Wichita Albany 7,005 ft., dry at 7,353 ft.

Reagan County: Skelly 1 Reagan-TXL, Sec. 45, Blk. 36, T-5-S, T&P Sur., 4 mi. S Glasscock Co. line elev. 2,686 ft., Yates 2,085 ft., dry at 3,366 ft.

Val Verde County: B. E. Wilson 1 Wilson & Hodge, Sec. 57, Blk. E, GC&SF Sur., 6 mi. N Juno, dry at 590 ft.

### SOUTHEAST NEW MEXICO

HOBBS. — In southeastern New Mexico Square Lakes field, Eddy County, reported two completions, Empire field, Eddy County, one, and Young field, Lea County, one. In Eddy County, Empire, Grayburg-Jackson, Square Lakes and Russell fields each had one location. Brunson field, Lea County, had two and Maljamar and West Roberts fields, Lea County, each had one. Eddy County has 28 drilling wells with 8 wildcats, and Lea County has 36 with 7 wildcats.

### SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: Mid-Continent 4 Christmas, 17-22s-37e, 1½ mi. S and slightly W Eunice-Ellenburger discovery, elev. 3,398 ft., Glorietta 5,040 ft., dry at 6,550 ft.

# SOUTH LOUISIANA

## Deep Well Completed in Caillou Island Field

NEW ORLEANS.—A good well was completed by The Texas Co. in the old Caillou Island field of Terrebonne Parish. It is the 79 State-Caillou Island on State Lease 188, Township 23s-20e, 900 ft. northwest of the 77 well. The well is flowing at a rate of better than 976 bbl. daily through a ¼-in. choke through 96 perforations at 11,754-86 ft. This is the deepest producer for the field. Total depth is 11,874 ft.

Irwin-Hudson et al 2-A Houssiere-Latreille, 29-9s-1w, in the Egan field area of Acadia Parish, has been completed as an excellent producer from the recently discovered new sand. The well came in and cleaned up flowing 22 bbl. hourly, or at the


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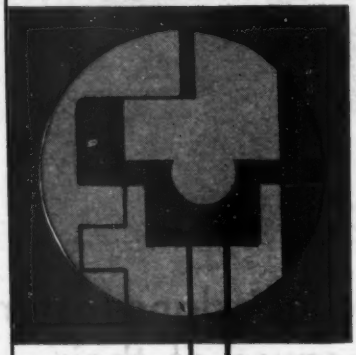

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rate of 528 bbl. of 37°-gravity pipe-line oil daily through a 12/64-in. choke with 1,765 lb. flowing pressure on the tubing and a gas-oil ratio of 796 to 1. Production is through 50 perforations at 9,920-25 ft. The new sand came in from 9,907-29 ft. This operator's 2-B Houssiere-Latreille, also at Egan, 30-9s-2w, is drilling ahead from 8,435 ft.

A deep test at Port Barre in St. Landry Parish, Pan American Production Co. 16 H. L. Garland, 4-6s-5e, has squeezed perforations from 9,040-48 ft., 8,982-98 ft. and 9,004-10 ft. after showing gas and some distillate with 1,850 lb. pressure. Hole has been plugged back and a production test is being made at 8,316-24 ft.

Pan American 15-A H. L. Garland, also in Port Barre field in St. Landry Parish, has been completed as a shallow producer, and gaged 100 bbl. fluid daily through an 8/64-in. choke with 350 lb. tubing pressure and 80 lb. pressure on the casing. It is showing 30 per cent salt water. Production is from open hole 2,545-60 ft.

Humble Oil & Refining Co. 1 Baist Cooperage Lumber Co., Inc., wildcat test in the Bayou Sorrell area of Iberville Parish, drilled into sand at a total depth of 10,960 ft., where the well kicked, blew the mud out of the hole, and caught fire. After burning for a short time, the well was choked off and brought under control. Operators now are clearing away the wreckage. This is a scheduled 12,000-ft. venture in 92-12s-13e.

There were 10 new locations reported this week, 2 being wildcats, 1 each in East Baton Rouge and St. Charles parishes. Two field openers, both in Beauregard Parish, were among the 12 completions for this week. Acadia, Beauregard, and Cameron parishes each received two completions.

**SOUTH LOUISIANA SUCCESSFUL WILDCATS**

Beauregard Parish: New oil pool, Singer field — Magnolia Petroleum Co. 2-C Lutcher-Moore Lbr. Co., NE SE 22-5s-11w, 4 mi. W of West Pinegrove field, TD 11,625 ft., plugged back TD 7,640 ft., perf. 7,627-31 ft. in Cockfield, PT 130 bbl. per day through 7/64-in. choke, gas-oil ratio 830 to 1, gravity 46°, no water.

Beauregard Parish: New oil pool, North Oretta field—Magnolia Pet. 1 M. J. Witzki, SE NW 22-6s-11w, 2 mi. N of Oretta field, TD 8,969 ft., oil sand 8,422-40 ft., perf. 24 holes 8,423-26 ft., PT 90 bbl. per day through 7/64-in. choke, tubing pressure 1,500 lb., gravity 45°, no water.

**SOUTH LOUISIANA WILDCAT FAILURES**

Assumption Parish: Danciger Oil & Ref. Co. and William Helis 1 Norman-Breaux Lbr. Co., Napoleonville area, 46-12s-13e, dry at 9,382 ft.

Cameron Parish: Humble 1-J Miami Corp., 17-13s-7w, dry at 10,192 ft.

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# TEXAS GULF COAST

## Sugar Valley Field Has New Pay Zone

HOUSTON. — A new oil pay has been opened in the Sugar Valley field in Matagorda County by Superior Oil Co. of California and John Blaffer 1 Culbertson, approximately 1 mile northeast of discovery well, and in Section 81 of P. Burnett and A. S. Sojourner Survey. Drilled to a depth of 10,662 ft., with 7-in. pipe cemented at 8,516 ft., this well flowed 245 bbl. of 43°-gravity oil daily through a 16/64-in. choke, with 2,540 lb. flowing pressure on the tubing, gas-oil ratio 10,117 to 1. Production is through perforations at 8,274-76 ft.

In the newly discovered Midfields area in Matagorda County, Magnolia Petroleum Co. is moving in derrick and materials to drill a test on the Live Oak Farms lease, to be known as the 1 Live Oak Farms. This test is approximately 1 mile east of Sun Oil Co.'s discovery well. Confirmation test to the 2 Strnadel, discovery well for Midfields field, is being drilled by Sun Oil Co. at 1 R. B. Trull, being 2,087 ft. northeast of the discovery in I&GN Survey, Block 6, and operators now are drilling sand and shale below 3,944 ft.

Also in the Midfields area, Matagorda County, Providence Oil Co. has located a wildcat test 4,600 ft. northeast of the discovery well, and is in the I&GN Survey, Abstract 212, Section 1, approximately ⅛ mile west of a dry hole which was drilled by J. K. Dorrance et al to a depth of 8,525 ft., completed in June 1938.

The Sour Lake field of Hardin County has been extended 2,000 ft. south by Watson L. Caldwell et al 1 Colby-Watson. The well flowed 138 bbl. of oil daily through a ½-in. choke, with 675 lb. tubing pressure, and casing on seal. Gas-oil ratio is 415 to 1, and gravity 32°, corrected. Hole was drilled to a total depth of 4,138 ft., with 5½-in. casing cemented on bottom and perforated with 60 shots from 3,928-43 ft. for completion. Fine grain sand with odor of gas was picked up from 4,128-31 ft., sandy shale with oil and gas shows from 3,895-3,928 ft., and fine dark sand with oil and gas saturation from 3,928-43 ft.

Superior Oil Co. 2-A Mrs. Myra S. Pryor, southwest outpost test at Altair field in Colorado County, has been completed and is reported to be flowing at the rate of 535 bbl. of high-gravity oil daily through a 16/64-in. choke with 2,200 lb. tubing pressure. Total depth is 8,475 ft., with 7-in. production pipe set on bottom, and perforated with 96 holes from 8,242-52 ft. for completion, showing 2,050,000 cu. ft. of gas along with the oil flow.

There were 16 new locations reported this week, 3 being wildcats, 2 in Harris County and 1 in Matagorda County. Of the 13 completions reported, 3 were wildcats, 1 a new oil pay in Sugar Valley field in Matagorda County, and 2 dry holes, 1 each in Chambers and Hardin counties.

**UPPER GULF COAST SUCCESSFUL WILDCAT**

Matagorda County: New oil pay, Sugar Valley field: Superior Oil Co. of Calif. 1 W. J. Culbertson, Burnett & Sojourner Sur., Abst. 13, Sec. 81, 4 mi. NE of Van Vleck, TD 10,662 ft., top sand 8,274 ft., perf. 8,274-76 ft., PT 256 bbl. per day through a 16/64-in. choke, 2,590,000 cu. ft. of gas, gas-oil ratio 10,117 to 1, tubing pressure 2,540 lb., gravity 43°, 0.5 per cent water.

**UPPER GULF COAST WILDCAT FAILURES**

Chambers County: Sun Oil Co. 1 Frankland, in East Smith Point area, in Henry Barker Sur., dry at 8,917 ft.

Hardin County: C. S. Gainer 1 A. Guedry estate, in M. Chavano Survey, Abst. 163, dry at 2,510 ft.

## CALIFORNIA

### New Oil Field Proved In Bandini Section

LOS ANGELES.—Richfield Oil Corp. appears to have definitely proved up the existence of a new oil and gas field in the Bandini section of Los Angeles Basin on the basis of the showings of 1 Union Pacific, completed last week, and a formation test on 1 Vail made a few days ago. The discovery well, 1 Union Pacific in 9-2s-12w, showed a high water cut upon completion at 8,590 ft. due probably to formation water, but the formation test on 1 Vail made a few days ago showed an initial flow of about 800 bbl. of fairly clean 30-gravity oil. The Vail well, located south of 1 Union Pacific, is higher stratigraphically than the initial completion on the Union Pacific property, although this same sand was logged in the discovery and is behind the shoe of the 6⅝-in. casing cemented at 8,570 ft. Several tests were made of this sand but it was not produced on the Union Pacific property. The showing of the Vail well tends to indicate the apex of the field will be found to the west, especially since Richfield's 1 Simons to the east failed to find the pay and was suspended at 8,024 ft. On the basis of limited data available, it appears quite possible Richfield has found the Santa Fe Springs anticline coming up again at Bandini although the accumulation at Bandini may not prove as large as Santa Fe Springs as the Springs is located in an area of great thickness of Pliocene and Miocene sediments.

The possible importance of General Petroleum's 1 Librown in the La Mirada district of Orange County is somewhat obscure due to the relatively small production and the extreme depth at which the sand was encountered. The well's significance with respect to the Buena Park field, where deep production and small well production prevails, remains to be determined. Texas and General Petroleum have pioneered exploration work at Buena Park and each has completed a deep well that showed small production. These deep wells are several miles apart and for this reason General Petroleum's 1 Librown has been listed as a tentative discovery as it may later be found to be a part of the Buena Park structure. As the matter stands, the completion can not be overlooked but at the same time the geographical location is open to question. Texas Co. after drilling several deep dry holes has apparently abandoned hope and will probably not undertake any additional drilling.

Ohio Oil Co. has started a second wildcat in the Gardena area west of the Dominguez field. The outcome of work on this well will be watched with considerable interest because of the showing of Ohio's initial wildcat which flowed at a good rate only to have water trouble develop and force


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abandonment. It is thought quite probable that Ohio encountered formation water in which event a more favorably located well might produce clean oil. Ohio's initial wildcat at Gardena produced too much oil to indicate the existence of a small accumulation and those familiar with conditions expect Ohio to open up a new field at Gardena when the right spot has been selected. Ohio's second Gardena wildcat is located in Section 23-3s-14w northwest of the company's initial test. East of the Dominguez field, Shell is making a production test on 1 Dominguez Estate in 2-4s-13w, but it may be another few days before the test is concluded. The interval being tested is at 8,660-10,478 ft., although the combination 5-in. and 5½-in. liner stopped at 10,419 ft. where a tight spot undoubtedly developed after drilling operations had been concluded. This outpost has logged several good showings and one upper sand failed to respond to a formation test, the sand being too tight. The lower interval being tested consists of sand and shale, there being no solid sand body present. It is being rigged to pump following the failure of the well to show sufficient kick to flow.

Tide Water Associated has filed an abandonment notice on 154 Luck, a deep test in the Kern River field. Although not officially announced, Tide Water Associated field men expected to complete this well as a producer and felt they had found a new productive horizon at Kern River. A promising oil sand was found, and three formation tests recovered water and oil. Field men are of the opinion that Tide Water Associated's 154 Luck is an edge well and on this basis expect the company to undertake additional exploratory work in the future. Which way to move for the next well will not be determined until a careful survey has been made, but there is a possibility the next location may be northeast of 154 Luck. The Vedder sand of Miocene age was barren in this test and the oil sand cored has been tentatively placed in the Eocene although there is a possibility the Walker, usually a non-productive zone, may have carried the 50-ft. interval that looked so promising.

New locations this week were lower than usual but this is probably a temporary condition and will be followed next week by a large number of projected wells. Drilling operations appear to be stabilized around 220 drilling strings and will probably remain at this level for the next several months. No appreciable gain in drilling can be anticipated at Bandini where Richfield appears to hold most if not all of the productive acreage, although this company may start several additional wells in the near future. Leffingwell and La Mirada will not show much change, and if operations continue at Edison and Cymric the present state average should be maintained.

**CALIFORNIA SUCCESSFUL WILDCAT**

Orange County, La Mirada: General Petroleum 1 Librown, 21-3s-11w, flowed 130 bbl., 27.9-gravity, 10 per cent cut, TD 12,200 ft., perf. 12,042-12,200 ft. Name of field and question of discovery tentative.

**CALIFORNIA WILDCAT FAILURES**

Monterey County, King City: Chanslor Canfield Midway Oil Co. 1 Salanco, 35-19s-7e, bottomed in barren gray sand and shale, no important showings logged, TD 2,627 ft.

Santa Barbara County, Lompoc: General Petroleum 3 Los Alamos, 31-8n-33w, bottomed in hard shale, only minor showings logged, TD 6,287 ft.

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## MICHIGAN

### Large Producer Completed In Deep River Field

SAGINAW.—While another 300-bbl. per hr. oil well was brought in in Arenac County's Deep River field, seven wildcat test completions were unsuccessful as the week's completions totaled 17 for 4 producers, a gas well, and 12 failures. Activity picked up, however, with eight new locations announced.

Freeman Oil Co. 1 State-Pioneer, Section 6 of Pioneer township, Missaukee County, one of the wildcat tests, got an oil show at 3,238 ft. in the Dundee, but was abandoned as a dry hole at 3,260. Bay, Mecosta and Ottawa completions brought small producers. In Lincoln township, Clare County, Taggart Bros. Gas Co. took over a Ranch Oil Co. test that went to 4,194 ft. and completed it as a gas well good for 4,200,000 cu. ft. a day at 1,617.

Eight new locations were announced, two each in Arenac and Van Buren, one each in Allegan, Isabella, Monroe and Newaygo counties.

**MICHIGAN WILDCAT FAILURES**

Allegan County, Wayland Township: J. W. Lang Co. 1 Albert Stora, 18-3n-11w, dry in Traverse linestone, TD 1,880 ft.

Arenac County, Lincoln Township: Sohio Petroleum Co. & C. W. Talbot 1 Lawrence A. Morley, 29-18n-4e, dry in Dundee, TD 3,022 ft.

Huron County, Hume Township: Sand Products Corp. 1 Fee, 8-18n-12e, dry in Detroit River, TD 3,200 ft.

Lenawee County, Hudson Township: Jesse L. England 1 Roger Dunigan, 7-7s-1e, dry in Trenton, TD 3,175 ft.

Midland County, Geneva Township: Cities Service Oil Co. 1 McCartney, 6-15n-2w, dry at 1,522 ft.

Missaukee County, Pioneer Township: Freeman Oil Co. 1 State-Pioneer, 6-24n-7w, dry in Dundee, TD 3,260 ft.

Montcalm County, Douglass Township: Sohio Petroleum Co. 1 Harry E. Doolittle, 11-11n-7w, dry in Dundee, TD 3,515 ft.

## ROCKY MOUNTAIN

### Important North Extension Indicated at Rangely

DENVER.—Another important extension of the Rangely field in western Colorado is imminent in Algord Oil Co. 1 Guiberson, C SE NE 18-2n-102w, an outpost ½ mile north of California Co. 2-B Gray, the nearest producer. It had the top of the Weber at 6,334 ft. and drilled to 6,571 ft. The 7-in. was cemented at 6,329½ ft. and at last report tubing was being run to wash in the well. The significance of the operation is that the bottom of the hole is 1,220 ft. below sea level, or 120 ft. lower than the heretofore estimated depth of the Weber saturation. The top of the Weber is put at 981 ft. below sea level, or 26 ft. lower than in Continental Oil Co. 1 Rooth 3½ miles to the west, which is in course of completion, and which it is estimated will bring an additional 6,300 acres within the potential productive area of the field. The Rooth well, 1½ miles northwest of the nearest producer, cored saturated Weber sand to 6,794 ft. It is preparing to run a drill-stem test. The corrected elevation of the top of the Weber in this well is —954 ft. The distance from the Rooth well on the northwest to the most southeasterly producer is now 8 miles and the limits of the field have not yet been defined in any direction.

**Small discovery in Utah.**—An oil discovery in the Crescent district, on a northwest extension of the Salt Valley Anticline in Grand County, Utah, is reported in Utah Drilling & Development Co. 2 State, NW NW NE 16-22s-19e. It was drilled to 1,215 ft., total depth, and after it was shot and acidized oil rose 600 ft. in the hole. It swabbed 50 bbl. in 2 days and is being put on the pump for a test. The crude runs about 38° gravity, is dark green in color and has an unusual odor. No laboratory analysis has been made. The well is located in a district that has large deposits of potash and other minerals and oil shows have been encountered in a number of tests drilled to determine the thickness and mineral content of the beds. In 1942 a test well was drilled 1¼ miles to the north by Defense Plant Corp. in cooperation with Utah Magnesium Corp., which went to 4,807 ft., having topped the Pennsylvanian formation at 2,116 ft. Results in most of the tests were not disclosed, but in this particular one it was revealed that the deposit was enormously rich in carnallite, metallic magnesium and potash. Several shows of oil and gas were encountered in the Dakota at 1,770-1,807 ft., in the lower Morrison at 1,935-2,019 ft., and at 4,178-207 ft. The latter was in shaly sand and fractures, and although carrying 10.8 lb. mud used in coring it built up a pressure of 500 lb. at the top of the casing above the mud. It bled several barrels of light oil through the valve several times. Farther to the southeast in 31-23s-21e, Utah Southern Oil Co. had a show for a 15-bbl. well in 1932, but drilled on down and abandoned the hole at 6,170 ft.

**Pure Oil at River Dome.**—Pure Oil Co. 1 Unit, NE NE NW 18-48n-92w, River Dome, Washakie County, Wyoming, after topping the Tensleep at 10,241 ft. and going through about 100 ft. of that formation, encountered a break, but again picked up the sand and apparently went out of it at around 10,440 ft. It showed some saturation, but no test was made. It was last reported drilling at 10,905 ft. and preparing to run casing.

**Sundance completion at Iles.**—Stanolind Oil & Gas Co. 22 Iles Unit, SW SW SE 22-

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4n-92w, Iles field, Moffat County, Colorado, was completed in the Sundance sand at 3,315 ft., with the 7-in. at 3,267 ft., and flowed 24 bbl. per hour through a 24/64-in. choke on the tubing. When this well was started it was erroneously reported that it would be a test to the Weber sand, the productive horizon at Rangely. However, the unit agreement signed last fall provided for a Sundance sand well in addition to the deep test which will be drilled this spring.

**Cat Creek extension.**—Continental Oil Co. 11 Brown, SE SW SE 17-15n-30e, ¼ mile west of its 10 Brown, in the Cat Creek field, Montana, was completed at 1,451 ft. and flowed 75 bbl. of fluid, 20 per cent oil, in 15 hours. The Ellis was at 1,425-44 ft., The well it offsets made 144 bbl. per day. The discovery well in the Ellis on the southeast flowed an average of 300 bbl. per day. On the theory that faulting accounts for the irregularity of the production, location has been made for 12 Brown in SE NE SE of Section 17, which is believed to be on the north side of the fault, and the outcome may help solve facts about the subsurface geology so far undisclosed.

**New operations.**—Ten new operations were reported, of which three are in Wyoming and seven in Montana. The Wyoming locations are Resolute Oil Co. on Badger Basin, Park County; Swartout, at Spence, in Big Horn County; and Continental Oil Co. 13 unit at Gebo. Five of the Montana locations are in Cat Creek, of which two are wildcats. These are Continental Oil Co. 12 Brown, SE NE SE 17-15-30, to test the Ellis north of a fault, and A. B. Cobb & Co. 1 Northern Pacific, NE NE SE 27-15-30, 1¾ miles southeast of the nearest producer, to be a deep test. Cut Bank and Kevin-Sunburst reported one each.

**Completions.**—Ten wells were completed, of which seven were oil wells with initial production of 2,676 bbl., and three dry holes. Five wells were wildcats, of which one for 25 bbl. was a discovery in Utah and the other for 24 bbl., was an extension at Cat Creek. The other three were dry. The best development well completed was Continental Oil Co. 3 Wright, in East Lance Creek, which produced at the rate of 960 bbl. per day from the Dakota, the largest well so far completed in that field. Rangely had one completion for 851 bbl.

**COLORADO WILDCAT FAILURE**

Orchard, Morgan County: Tide Water Assoc.-Ohio Oil Co. 7-30 Williams, NW SW SW 30-5n-60w, dry at 7,268 ft., Dakota 6,514-6,678 ft., Lakota 6,798-6,963 ft., Lykins 7,247 ft.

**MONTANA SUCCESSFUL WILDCAT**

Cat Creek, Petroleum County: Continental Oil Co. 11 Brown, SW SE SE 17-15n-30e, flowed 75 bbl. fluid in 15 haurs, 20 per cent oil, Ellis 1,425-44 ft., TD 1,451 ft., extension to Cat Creek.

**UTAH SUCCESSFUL WILDCAT**

Crescent, Grand County: Utah Drlg. & Dev. Co. 2 State, NW NW NE 16-22s-9e, swabbed 50 bbl. in 2 days from sand at 1,123 ft., probably Dakota, TD 1,215 ft.

**WYOMING WILDCAT FAILURES**

Bailey, Carbon County: Phillips Pet. Co. 1 Dome, SE SW SW 15-27n-89w, dry at 5,499 ft., Sundance sand 5,280 ft.

Mellum, Natrona County: Continental Oil Co. 1 Allen, SE NE NE 13-29n-82w, dry at 4,420 ft. in Deadwood sand, Tensleep 3,725 ft., Madison 4,250 ft.


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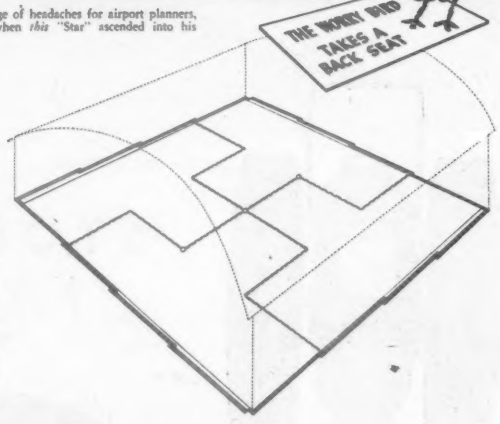


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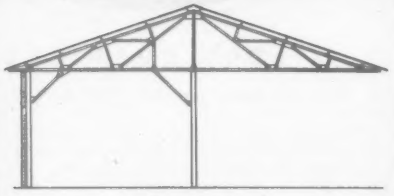

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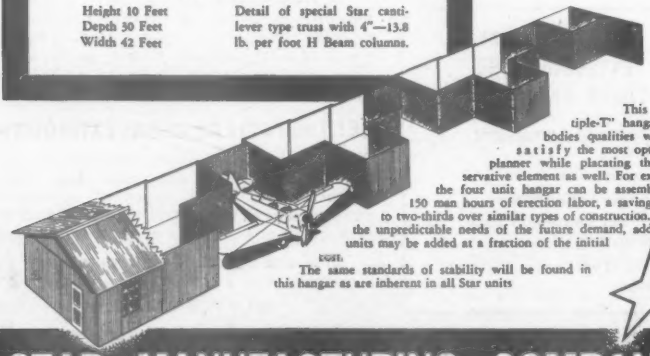

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# CANADIAN FIELDS

## Prospects Dim for North Turner Valley Extension

CHATHAM. — Results so far secured in two North Turner Valley Extension outpost tests are reported negative. Home Oil 20, LSD 7, 24-21-4w5, with Madison at 9,303-9,577 ft is standing after tests of the upper porous horizon. Home 21, LSD 11, 34-21-4w5, with Madison contact at 9,582 ft., made a preliminary test of the upper porous at 9,655-9,745 ft. and deepened to test the lower porous, halting drilling at 9,826 ft.

Foothills Oil & Gas 23, LSD 3, 9-21-3w5, on the east flank of the North Extension, with Madison at 8,320-8,726 ft. flowed 148 bbl. and is acidizing in both zones. In the North-Central area, Royalite 85, LSD 3, 2-20-3w5, with Madison at 8,194-8,476 ft. produced around 150 bbl. with booster gas and is reacidizing. Okalta Oils 22, LSD 8, 1-20-3w5, total depth 4,508 ft., drilled as a test of shallow horizons above the lime, is finishing with about 30 bbl. from the McDougall-Segur sand after several dynamite shots.

**Brazeau.**—On the Brazeau structure in the Central Alberta foothills, Home-Brazeau Syndicate 1, LSD 5, 17-34-17w5, sponsored jointly by Home Oil, Anglo-Canadian, Imperial Oil, Shell, Socony-Vacuum and California Standard, reentered the Madison limestone at 11,351 ft. and is drilling open hole to production. First Madison lime at 9,498 ft. had shown good evidence of wet gas when the well faulted back to the Fernie and later the upper Blairmore before redrilling the normal series to the limestone.

**Kinsella.**—In the Kinsella field, east of Edmonton, Imperial-Kinsella 5, LSD 7, 11-48-9w4, total depth 1,940 ft., had initial open flow of 8,148,000 cu. ft. gas. Imperial-Kinsella 2, LSD 11, 20-48-9w4, previously unreported, finished at 2,130 ft. with 19,500,000 cu. ft. Aggregate open flow from four gassers completed by Imperial is 36,403,000 cu. ft. One well is testing and one starting with two locations.

**Lloydminster.** — Production from the Lloydminster field in eastern Alberta and western Saskatchewan for January totaled

9,139 bbl. of 14-gravity oil of which 5,425.1 bbl. came from six wells in Saskatchewan and 3,713.9 bbl. from eight wells in Alberta. Several additional wells are drilling or located.

## OHIO, KENTUCKY

### North Canton Gas Area Extended Westward

COLUMBUS.—The North Canton gas producing area was extended ½ mile farther west by Smith Petroleum 1 Ravenna Realty, Section 31, Plain Township, Stark County. White Clinton at 4,530-48 ft. gaged 894,000 cu. ft. natural and was shut in after shot at 2,494,000 cu. ft.

R. R. Murray 1 Laurence-Johnson Consolidation topped the Oriskany at 3,123 ft., and at 3,142 ft. gaged 1,295,000 cu. ft. which caught fire. The fire was extinguished within a few hours and the well is being tubed. As the well is an important extension to the Wheeling field, offsets to the south and west will be drilled.

The Preston Oil now has seven drilling machines ready to go in the Hemlock Grove Berea pool. These, together with the five independents already drilling, will make the pool one of the most active.

The 23 new locations were well distributed, Sandyville 6, Ashland-Lorain 5, Cambridge and Lancaster 3 each, and 2 in each of the other fields. Of the 21 completions Ashland-Lorain had 6, Stewart 5, and Lancaster and Mount Vernon 3 each.

**OHIO SUCCESSFUL WILDCATS**

Mahoning County, Goshen Township: J. W. McIntosh 1 Geo. W. Dunn, Sec. 1, lime 3,235 ft., Oriskany 3,522 ft., 125,000 cu. ft., TD 3,532 ft.

**OHIO WILDCAT FAILURE**

Meigs County, Rutland Township: Ohio Fuel 1 B. H. Carson, Sec. 18, Berea 1,553-63 ft., TD 1,573 ft.

**WESTERN KENTUCKY**

OWENSBORO.—O. Blankenship et al 1 F. W. Vogel, 12-P-23. Henderson County wildcat, has encountered a show of oil in the McClosky and has set pipe to test. A 1-hour drill-stem test at 2,484-89 ft. recovered 3 ft. of oil and 270 ft. of mud.

Calstar Petroleum Co. 1 C. Blake, 22-P-20, Union County wildcat, is waiting on cable tools to start testing saturation encountered in the Cypress at 2,299-2,305 ft. and the McClosky at 2,589-94 ft., total depth 2,650 ft.

Two oil wells and two dry holes, one a wildcat in Daviess County, were completed in Western Kentucky during the past week. Three new operations were announced, two in Union County and one in Ohio County.

**WESTERN KENTUCKY WILDCAT FAILURE**

Daviess County: Callas-Asdell et al Simon Smith, NW NW NW 14-P-29, elev. 403 ft., dry at 1,803 ft., Waltersburg 1,062 ft., Viola 1,121 ft., Golconda 1,331 ft., Barlow 1,438 ft., Renault 1,552 ft., Ste. Genevieve 1,623 ft.

**INDIANA**

EVANSVILLE.—W. L. Lichlyter et al 1 Ray Johnson, NE NE SE 9-1s-9w, wildcat 8 miles northwest of Princeton, has definitely opened a new oil-producing area in Pike County. Operators are pumping on beam to test the Cypress sand at 1,393-1,405 ft. following a 20-qt. shot. Total depth is 1,405 ft. The 1 Johnson made 46 bbl. of oil in the first 12 hours and has been estimated as a 35 to 50-bbl. well. It is 1 mile northeast of the Wheeling pool.

About 5 miles east of Princeton, Gibson County, John Kabana and L. A. Plumb 1 Coleman Community, SW SW NW 7-2s-9w, has 5½-in. casing set at 1,930 ft. Operators will gun perforate to test the Rosiclare at 1,791-1,804 ft. and the McClosky at 1,861-


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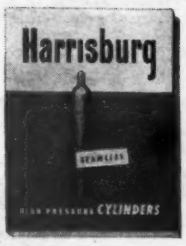


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56 ft. and 1,891-96 ft. Saturation was found in both zones and operators believe the well will complete for 100 bbl. of oil daily or more. It is about 1½ miles from other oil producers and may open a new pool.

Thsee completions were reported for the past week, all oil wells. Three new operations were reported and drilling permits were issued for five additional tests.

## ILLINOIS

### Devonian Lime May Be Third Pay Zone in Mattoon Field

MATTOON.—National Consumers Oil Co. 3 M. B. Herkimer, SW NE NE 11-12n-7e, Devonian test in the Mattoon field of Coles County, recovered about 1½ bbl. oil, 1 bbl. of drilling mud and 200,000 cu. ft. gas on preliminary tests made during the past week. The Devonian was topped at 3,117 ft. and hole was bottomed at 3,170 ft. Operators are now setting a plastic plug to test the Devonian breaks separately. If the 3 Herkimer is successfully completed, it will open the third and perhaps most important pay zone for the field.

In Hamilton County, Sohio Petroleum Co. 1 O. McMahon, SW SW SE 12-6s-7e, wildcat 4 miles east of the Dale-Hoodville Consolidated field, was reported drilling at 3,067 ft. after topping the Glen Dean at 2,693 ft. and the Barlow at 2,931 ft. A Wayne County willdcat, Pure Oil Co. 1 A. S. Yerks, SW SE SW 1-1s-7e, was testing the McClosky at a total depth of 3,225 ft.

Phillips Petroleum Co. 1 R. E. Okerson, NW SW NE 9-7s-8e, outpost well ½-mile east of the Roland field, is waiting on cement with 5½-in. pipe set at 3,115 ft. Saturation was found in the McClosky at 3,020-24 ft., and 3,099-3,103 ft.

Completions for the past week in Illinois totalled 38, of which 25 were oil wells and 13 were dry holes. Seven of the dry holes were wildcats. New operations reported totaled 29, of which 6 were wildcats. Nine of the new operations were located in the Mattoon field.

#### ILLINOIS WILDCAT FAILURES

Champaign County: D. K. Roth 1 D. P. Zehr, SE NE NE 6-22n-8e, dry at 320 ft., Devonian 226 ft., Silurian 260 ft.

Jasper County: J. J. Lynn 1 C. O. Ochs, SE SE SE 21-6n-10e, dry at 2,896 ft., Tar Springs sand 2,186 ft., Glen Dean 2,286 ft., Barlow lime 2,426 ft., Paint Creek 2,619 ft., Renault 2,691 ft., Aux Vases 2,712 ft., Ste. Genevieve 2,755 ft., Fredonia 2,791 ft.

Monroe County: H. C. Hageman et al 1 Coen, SW SE NE 28-3n-11w, dry at 2,060 ft.

Richland County: Pure 1 E. Eberhardt "A," S½ SW NE 32-3n-10e, dry at 3,250 ft., Menard 2,339 ft., Tar Springs sand 2,477 ft., Glen Dean 2,586 ft., Barlow 2,767 ft., Benoist 3,021 ft., Ste. Genevieve 3,147 ft., Lower O'Hara 3,154 ft., Rosiclare 3,166 ft., Fredonia 3,172 ft., McClosky 3,176 ft.

J. J. Lynn 1 Waughtell, E½ NE SE 1-2n-9e, dry at 3,210 ft., Ste. Genevieve 3,106 ft., Rosiclare 3,134 ft., Fredonia 3,146 ft., McClosky 3,149 ft., junked hole, skidded 100 ft. west.

St. Clair County: C. W. Young 6 McCurdy, SW SW 29-3s-6w, dry at 2,368 ft.

## OKLAHOMA

### Simpson Zone Shows Oil in Murray County Wildcat

OIL shows in the Simpson zone have been reported at Helmerich & Payne, Inc. 1 Sadler, SW NW NE 29-1n-2e, Murray County wildcat 1½ miles north of the town of Davis. Casing will not be set, however, until contract depth of 3,100 ft. has been reached. Starting at a surface elevation of 899 ft., the wildcat encountered sand streaks with asphaltic staining at 1,653-82 ft. A sand and lime was penetrated from 1,923-43 ft. which put oil over the pits estimated at about 27° gravity. The Simpson zone was topped at 2,240 ft. and a soft sand was drilled from 2,298-2,328 ft. A sand topped at 2,844 ft. showed staining and saturation at 2,843 ft. with samples taken at other depths also showing slight staining and odor.

The 1 Sadler is located on a large structure where several test wells have been drilled in the past. One of these, drilled 3 miles north of the present test, recovered a large volume of gas and later made oil. Another, about 1 mile north and slightly east of the Sadler well, was junked at 1,964 ft. with considerable oil in the hole. From the results of these former tests, it is believed that the best prospects for the present test are in the Pennsylvanian sand and lime zone at 1,923-43 ft.

Deep Rock Oil Corp. et al have apparently hit their third producer in the West Billings pool, located in the northwest corner of Logan County. A drill-stem test of the new producer, 2 White, NE NE NE 19-23n-2w, east offset to the discovery well, got a natural flow of oil in 18 minutes, with gas estimated at 1,000,000 to 1,500,000 cu. ft. daily showing immediately after the tool was opened. Production was estimated at 25 to 30 bbl. of oil an hour. Casing will be run to complete.

Vickers Petroleum and Globe Oil & Refining Co. 1 Gibson, SE NE 30-3n-2w, discovery well 3 miles southwest of Antioch, Garvin County, has been shut in for 12 to 24 hours for bottom hole pressure tests. On preliminary tests the well flowed 295 bbl.

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| | |
|---|---|
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| Length of Bench | 8' |
| Width of Bench | 30" |
| Height, front | 32" |
| Height, back | 4' 6" |

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of oil in 24 hours, cutting as high as 17 per cent mud and drilling fluid. Gage was made through a ⅝-in. top hole choke. Production is through perforations opposite the Pennsylvanian sand at 6,533-39 ft.

The new Wilcox discovery in Logan County, Sinclair-Prairie et al 1 Teuscher, SE SE SW 34-15n-1w, was opened at the end of the week following a week shut-in period for the erection of tanks and separators. It flowed 549 bbl. of oil in 24 hours through a 1-in. choke with gas gaging 503,000 cu. ft. Production is from the second Wilcox sand at 5,929-41 ft.

Another Logan County wildcat, Jordan Petroleum Co. 1 Dean, NW NW NE 7-15n-1e, is attracting considerable attention since entering the Bartlesville zone. It is about 2 miles east of the North Evansville pool and has logged the Bartlesville at 5,091-5,122 ft., 67 ft. higher than some of the Evansville wells. A core of the sand contained a rich show of oil. Operators are drilling ahead at 5,288 ft. in shale containing sand stringers.

**OKLAHOMA SUCCESSFUL WILDCATS**

Canadian County: Fox & Fox 1 Simpson, SE SE SW 9-14n-5w, 5 bbl. from Bartlesville at 7,082-95 ft., TD 8,366 ft.

Creek County: Skelly 1 Hobart, NE SW SE 8-17n-10e, 45 bbl. from Wilcox at 2,976-83 ft., TD 2,989 ft.

Hughes County: E. L. & M. Drilling Co. 1 Cox, SE NE NW 16-9n-9e, 6,000,000 cu. ft. gas from Booch at 2,723-40 ft., TD 3,378 ft.

Stephens County: Magnolia 1 Simpson, SW SW NE 17-2n-8w, 8,500,000 cu. ft. gas from sand at 5,140-80 ft., TD 6,890 ft.

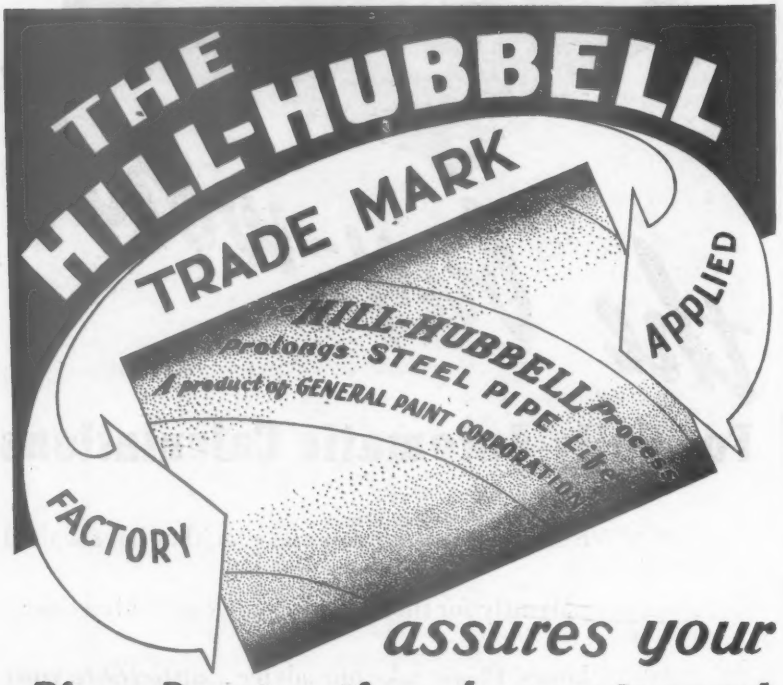
**OKLAHOMA WILDCAT FAILURES**

Creek County: C. E. Beal 1 Young, SE NE NW 24-18n-8e, dry at 3,065 ft., Mississippi 3,020 ft.

Lincoln County: R. H. Pierce 1 Hertz, SW SW SE 7-15n-5e, dry at 3,502 ft., Prue 3,491 ft.

Hubble & Webb 1 Bukaty, NE NE NE 19-15n-6e, dry at 3,375 ft., Skinner 3,370-75 ft.

Seminole County: Big Chief 1 Mathis, NW NW SW 35-6n-6e, dry at 2,486 ft., Cromwell 2,387 ft.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## MISSISSIPPI

### Carthage Point Well Flows Gas and Condensate

JACKSON.—The Humble Oil & Refining Co. 1 Mrs. C. L. S. McKittrick flowed 808,600 cu. ft. of gas and 67.45 bbl. of 56.4-gravity condensate in 24 hours after operators had drilled out to 10,285 ft. and perforated at 10,278-83 ft. Operators are now testing. The well is in the Carthage Point pool, 12-6n-3w, Adams County.

After a flow of 35 bbl. oil and 70 bbl. salt water in 24 hours from the Phillips 1 Davey, 46-8n-2w, Adams County, perforations were squeezed. The well was re-perforated at 10,060-070 ft. and operators ran 2-in. tubing on packer. Wash water was swabbed down to approximately 6,000 ft. with no fluid coming into hole. Perforation bullets apparently did not perforate and operators are pleted in Mississippi. The Tinsley field well conditioning hole to re-perforate.

Two successful field wells were comflowed 146 bbl. of oil in 12 hours. Gas and condensate was recovered from the Hub field well.

## LA.-ARK.

### East Haynesville Pool Gets New Producer

SHREVEPORT.—A new producer for the East Haynesville field flowed 243.6 bbl. oil in 14 hours after perforations at 5,134-48 ft. in the Pettit. The well is Skelly 1 Longino, 23-23n-7w, Claiborne Parish.

Union Producing Co. 1 Belgard, a wildcat in NW 14-4n-32, Rapides Parish, was bottomed at 10,025 ft. Operators set 7-in. pipe at 10,021 ft. and are drilling to 12,000 ft. The well is located approximately 1 mile north of the Big Island field.

North Louisiana had 13 completions during the week, of which 2 were dry wildcats, one each in Franklin and Sabine Parishes. The remaining completions included seven oil wells, five at Big Creek and two at Delhi, two gas wells, one each at Monroe and Cotton Valley, and one dry hole each for the Ashland and Homer fields.

Texas Company is rigging up rotary on the 1 Persons, wildcat in NW SE 29-16s-25w, Miller County, Arkansas. The location is northwest of the Lewis field pool.

Total completions for Arkansas were four, with two oil and two dry wells.

**ARKANSAS SUCCESSFUL WILDCAT**

Ouachita County: McAlester Fuel Co. B-2 C. M. Wesson, NE SE NW 34-15s-19w, 101 bbl. from Travis Peak at 3,486-3,500 ft., TD 3,951 ft.

**ARKANSAS WILDCAT FAILURE**

Arkansas County: C. E. Osborne 1 Stuttgart-Price, 1,060 ft. south and west of center of 16-2s-3w, dry at 2,540 ft.

**NORTH LOUISIANA WILDCAT FAILURES**

Franklin County: Big Chief Drilling Co. 1 J. T. Ingram, SE SE SE 4-13n-6e, dry at 5,680 ft.

Sabine County: T. L. James 1 Brown, NE SW 6-9n-12w, dry at 6,215 ft.

## KANSAS

### Possible New Gas Pool For Barber County

PROSPECTS for a gas discovery well were brightened after the Continental Oil Company gaged 2,250,000 cu. ft. of gas after perforations at 4,718-20 ft. in the 1 Skinner, northwestern Barber County. The test is SE NE NE of 33-31-15w and about two miles east of the old Bear Creek pool. TD is 5,167 ft. and the well has been plugged back to 4,780 ft. Perforations have been made in the Mississippi at 4,697 to 4,720 ft. and the hole is shut in. Operators are preparing for an open flow test.

Currier & Keys 1 Crawford, SE SW NW 18-14-2w, a wildcat in Saline County, pumped 50 bbl. of oil per day. TD is 3,275 ft. with a 1,000 ft. of oil in the hole in 12 hours. Operators are now testing the well.

Completions for Kansas totaled 37. There were 15 dry holes of which 5 were wildcats. Four wells produced gas and 18 oil.

**KANSAS WILDCAT FAILURES**

Barton County: Jones & Shelbourne 1 Oetken, NW NW NE 28-19s-15w, dry at 3,710 ft., Arbuckle 3,656 ft.

Ira Keith 1 Hammeke, SE SE SW 13-19s-19w, dry at 3,386 ft., Arbuckle 3,354 ft.

Butler County: H & M Drilling Co. 1 Stern, SE SW NW 22-27s-6e, dry at 3,062 ft., Viola 3,060 ft.

Kingman County: Cities Service Oil 1 Kincaid, SW SE SW 8-29s-5w, dry at 4,525 ft., Arbuckle 4,492 ft.

Pratt County: Huber & Hatfield 1 Stanley, approximately center of S/2 NE NE and 990 ft. west of northeast corner, 30-27s-13w, dry at 4,585 ft., Arbuckle 4,534 ft.

## APPALACHIAN FIELD

### Ravenswood District Gets Large Gas Well

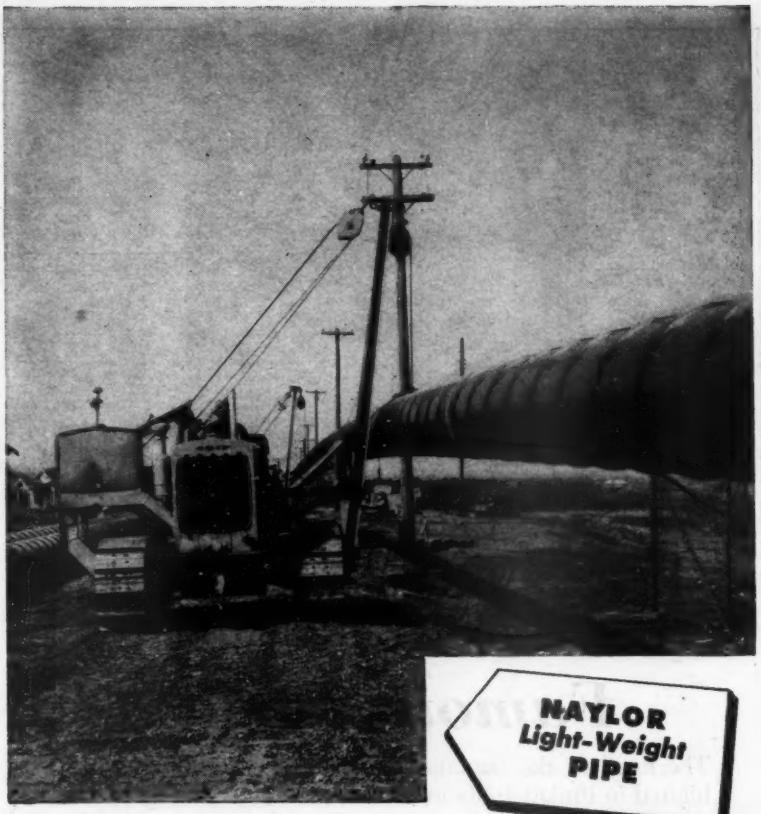
PITTSBURGH.—In Ravenswood district, Jackson County, West Virginia, United Fuel Gas Co. is completing test No. 5,675 J. L. Nelson with the top of the Corniferous lime at 4,835 ft.; Oriskany 4,946 ft.; 980,000 cu. ft. gas at 4,946-50 ft., which increased to 2,630,000 cu. ft. at 4,969 ft. The surface elevation is 716 ft.

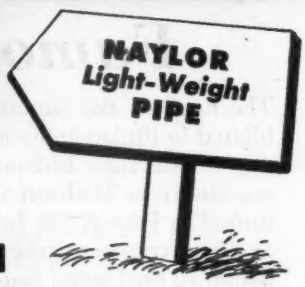
In Elk district, Kanawha County, United Fuel Gas Co. topped the Oriskany sand at 5,036 ft. in the test 5,705 Nancy E. Myers, with 298,000 cu. ft. gas at 5,050-51 ft., and then shut down to test the 7-in. casing. The surface elevation is 798 ft., with the Corniferous lime topped at 4,935 ft. In this district nine other wells are drilling with other rigs standing.

In Preston County, the wildcat of William E. Snee et al on Harry Sisler farm in Portland district, which was drilled through the Oriskany sand, and which is gaging over 50,000 cu. ft. gas and slightly increasing, will not be shot at this time but the derrick has been left standing. A new test will be made on this structure, the location of which will be announced as soon as surveyed.

In Otter district, Braxton County, Hope Natural Gas Co. is drilling out cement after setting casing in the Corniferous lime in the wildcat on Ed L. Boggs farm, and the Oriskany sand should be reached within the week. The Corniferous lime was topped at 6,105 ft., from a surface elevation of 1,055 ft., and the tools are now at 6,168 ft.

In southwest Pennsylvania, Charles E. Young drilled the test on the White Turkey farm in North Strabane Township, Washington County, to 2,671 ft., finding only 2-ft. shell at 2,597 ft., instead of the

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The hand of the famous Statue of Liberty was first exhibited in Philadelphia in 1876 at the Centennial Celebration of American Independence. Later in the same year it was shown at Madison Square in New York and then returned to France. On July 4, 1884, in Paris, the complete 152-foot copper statue was formally presented to the people of the United States by the people of France in commemoration of the 100th anniversary of American Independence. The following year it was taken apart, brought to America, and erected on Bedloe's Island in the great harbor of New York, where it was dedicated before a million people, October 28, 1886.

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## SUMMARY OF JANUARY COMPLETIONS *

| | Comp. | Oil | Prod. | Gas | Dry | Under 1,000 ft. | 1,000-2,500 ft. | 2,500-5,000 ft. | 5,000-10,000 ft. | Over 10,000 ft. | Total footage | Rigs and drilling |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New York | 111 | 57 | 92 | 0 | †54 | 0 | 111 | 0 | 0 | 0 | 184,381 | 129 |
| Pennsylvania | 251 | 134 | 176 | 5 | ‡112 | 27 | 205 | 19 | 0 | 0 | 356,137 | 241 |
| West Virginia | 52 | 11 | 66 | 32 | 9 | 0 | 30 | 22 | 0 | 0 | 142,344 | 76 |
| Ohio | 65 | 13 | 202 | 34 | 18 | 5 | 22 | 36 | 2 | 0 | 179,741 | 185 |
| Indiana | 28 | 16 | 3,526 | 0 | 12 | 1 | 19 | 7 | 1 | 0 | 63,447 | 52 |
| Kentucky | 48 | 16 | 1,689 | 13 | 19 | 2 | 27 | 19 | 0 | 0 | 104,781 | 44 |
| Illinois | 154 | 92 | 13,987 | 1 | 61 | 3 | 67 | 84 | 0 | 0 | 370,289 | 245 |
| Michigan | 58 | 26 | 8,242 | 6 | 26 | 1 | 23 | 33 | 1 | 0 | 8,242 | 147 |
| Kansas | 157 | 78 | 30,419 | 24 | 55 | 0 | 8 | 148 | 1 | 0 | 527,322 | 321 |
| Neb., Mo., Iowa | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 5,110 | 12 |
| Oklahoma | 206 | 121 | 24,655 | 14 | 71 | 4 | 44 | 107 | 50 | 1 | 779,291 | 552 |
| Texas | 613 | 369 | 74,312 | 36 | 208 | 29 | 142 | 209 | 227 | 6 | 2,688,534 | 969 |
| North | 181 | 109 | 26,426 | 1 | 71 | 25 | 72 | 53 | 31 | 0 | 524,275 | 192 |
| West Central | 44 | 23 | 7,605 | 4 | 17 | 2 | 19 | 22 | 1 | 0 | 105,948 | 73 |
| West | 132 | 98 | 46,321 | 5 | 29 | 1 | 32 | 49 | 48 | 2 | 606,210 | 244 |
| Panhandle | 28 | 13 | 1,170 | 2 | 13 | 0 | 5 | 22 | 1 | 0 | 86,143 | 90 |
| Eastern | 60 | 27 | 7,698 | 18 | 15 | 0 | 1 | 27 | 32 | 0 | 339,214 | 124 |
| Upper Gulf Coast | 60 | 32 | 5,573 | 0 | 28 | 0 | 2 | 6 | 49 | 3 | 426,161 | 104 |
| Lower Gulf Coast | 74 | 53 | 8,184 | 0 | 21 | 0 | 0 | 14 | 59 | 1 | 481,377 | 103 |
| South | 26 | 13 | 1,300 | 4 | 9 | 0 | 10 | 12 | 4 | 0 | 82,826 | 20 |
| South Central | 8 | 1 | 35 | 2 | 5 | 1 | 1 | 4 | 2 | 0 | 36,380 | 19 |
| Louisiana | 96 | 67 | 14,071 | 9 | 20 | 1 | 9 | 24 | 43 | 19 | 632,424 | 228 |
| Northern | 51 | 32 | 7,330 | 7 | 12 | 1 | 9 | 23 | 15 | 3 | 219,873 | 118 |
| Southern | 45 | 35 | 6,741 | 2 | 8 | 0 | 0 | 1 | 28 | 16 | 412,551 | 110 |
| Arkansas | 9 | 5 | 606 | 0 | 4 | 0 | 0 | 7 | 2 | 0 | 40,011 | 46 |
| Mississippi | 18 | 11 | 1,531 | 0 | 7 | 0 | 0 | 2 | 12 | 4 | 133,269 | 61 |
| Ala., Ga., Florida | 6 | 1 | 41 | 0 | 5 | 0 | 1 | 2 | 1 | 2 | 45,287 | 15 |
| Montana | 22 | 16 | 1,941 | 2 | 4 | 1 | 10 | 11 | 0 | 0 | 49,639 | 53 |
| Wyoming | 13 | 5 | 628 | 3 | 5 | 1 | 1 | 6 | 5 | 0 | 58,011 | 78 |
| Colorado | 10 | 9 | 3,443 | 0 | 1 | 0 | 0 | 2 | 8 | 0 | 63,184 | 46 |
| New Mexico | 36 | 24 | 5,023 | 3 | 9 | 1 | 10 | 17 | 8 | 0 | 132,391 | 82 |
| California | 171 | 127 | 23,927 | 5 | 39 | 2 | 49 | 72 | 41 | 7 | 695,246 | 223 |
| Total January | 2,125 | 1,198 | 208,577 | 187 | 740 | 78 | 778 | 827 | 403 | 39 | 7,259,081 | 3,805 |
| Total December | 2,426 | 1,330 | 314,083 | 258 | 838 | 118 | 816 | 1,012 | 432 | 48 | 8,504,768 | 3,827 |

*Four weeks ending January 26, 1946. Service wells included: †54, ‡103.

Fifth sand, the remaining formation being slate. It was plugged back to the Gantz sand where it was shot with a bomb after which the bridge was cleared. No estimate of the Gantz oil has been made. To the southwest, this operator shot the Gantz sand in the test on the Harry Hatfield farm which was drilled to 2,781 ft., or through the Gordon, Fourth and Fifth horizons without finding any pays except for the showing of about 1½ bbl. oil in the Gantz sand. After shot, the oil has not been recovered but the hole is being tested.

In Mercer County, Hart & Hickman are drilling at 1,790 ft. in the Oriskany wildcat on the Herman Smith farm in West Salem Township with the Berea placed at 425-75 ft.

New locations during the week totaled four scattered in Buffalo and Kittanning townships, Armstrong County, and Porter and Red Bank townships in Clarion County.

## A.P.I. Group to Formulate Oil-Analytical Methods

NEW YORK.—To develop and formulate methods of analyses needed by the petroleum industry for intermediate products of manufacture and for control of manufacturing processes, the American Petroleum Institute, January 26, announced the formation of a new standing committee on analytical research.

This committee, the announcement explains, "is to continue in peacetime the type of activity conducted in wartime by the analytical subcommittee of the technical advisory committee of the Petroleum Industry War Council."

Harry Levin, The Texas Co., is chairman, with E. L. Baldeschwieler, Standard Oil Development Co., as vice chairman, and C. E. Headington, Atlantic Refining Co., as secretary.

# CALENDAR

**February**

American Society for Testing Materials, spring meeting, Pittsburgh, February 25-March 1.

A.I.M.E., petroleum division, annual meeting, Palmer House, Chicago, February 25-28.

Exposition of Chemical Industries, twentieth exposition, Grand Central Palace, New York, February 25-March 2.

**March**

Southern California Meter Association, nineteenth annual Hi-Jinks, Rio Hondo Country Club, Downey, Calif., March 2.

Society of Automotive Engineers, German engineering evaluation meeting, Rackham Educational Memorial, Detroit, March 4.

Oklahoma Utilities Association, annual convention, Biltmore Hotel, Oklahoma City, March 11-12.

Southern Gas Association, annual convention, Galveston, March 21-22.

Western Petroleum Refiners Association, annual meeting, Blackstone Hotel, Fort Worth, March 25-27.

American Gas Association, conference on industrial and commercial gas, Commodore Perry Hotel, Toledo, March 29-30.

American Institute of Chemical Engineers, regional meeting, Rice Hotel, Houston, March 31 to April 3.

**April**

FPC regional hearing in natural-gas investigation, House of Delegates Chamber, State Capitol Building, Charleston, W. Va., April 2.

American Association of Petroleum Geologists, annual meeting, Stevens Hotel, Chicago, April 3-5.

Midwest Power Conference, Palmer House, Chicago, April 3-5.

A.P.I. division of production, Pacific Coast district, spring meeting, Biltmore Hotel, Los Angeles, April 11-12.

Interstate Oil Compact Commission, spring meeting, Tulsa, April 11-13.

Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas, April 17-19.

National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland, Ohio, April 18-19.

Southwestern Gas Measurement Short Course, Norman, Okla., April 23-25.

A.P.I. directors' meeting, Blackstone Hotel, Fort Worth, April 28.

Independent Petroleum Association of America, midyear meeting, Houston, April 29-May 1.

**May**

Pennsylvania Gas Association, Galen Hall, Wernersville, Pa., May 7-9.

Natural Gas Department, American Gas Association, annual spring meeting, Hotel Gibson, Cincinnati, May 7-8.

National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City, Mo., May 7-9.

Petroleum Industry Electrical Association and Petroleum Electrical Supply Association, eighteenth annual joint conference, Mayo Hotel, Tulsa, May 7-9.

**June**

Society of Automotive Engineers, semiannual meeting, French Lick, Ind., June 2-7.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette, Lexington, June 7-8.

A.P.I. division of production, spring meeting, William Penn Hotel, Pittsburgh, June 13-14.

American Society for Testing Materials, annual meeting, Buffalo, June 24-28.

**September**

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

**November**

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

**1947**

**May**

International Petroleum Exposition, Tulsa, May 17-24.

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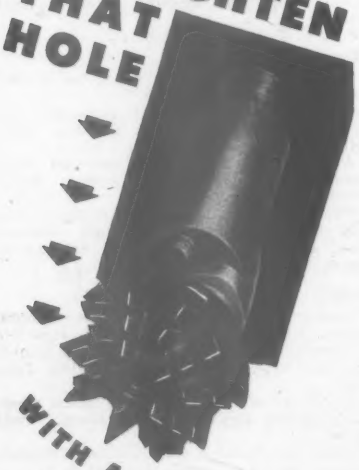

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# Among the Drilling Contractors

**Kirkpatrick & Bale, Inc.** is moving rig to Stephens County, Oklahoma, to drill two tests for Allied Oil Co. The corporation has embarked recently in the contracting business and has one rig capable of 5,000 ft.

**George - Wrather Drilling Co.** will drill the 1 N. Weber, SE NE NE 5-5n-6w, Madison County, Illinois. The contract is with Aetna Oil-W. D. Flynn.

**Jackson Drilling Co.** is setting surface pipe at the 1 Moelling, a test for Westgate-Greenland Oil Co. The well is NE SW NW 30-21n-2w, Noble County, Oklahoma.

**Can-Tex Drilling Co.,** Calgary, Alta., is moving rig for Burdett-Province 4, LSD 16, 13-7-13w4, a new exploratory test for California-Standard Oil Co. in the Burdett area of southern Alberta. The well will test the Ellis sand in an area where recent wildcat tests have encountered encouraging indications.

**Capitol Hill Drilling Co.,** with capital of $100,000, and Clark & Campbell Drilling Co., with $10,000 capital, have been granted permit to operate in Oklahoma. Both companies hold Delaware charters.

**Olsen-Blount Drilling Corp.,** Oklahoma City, was shut down for repairs at the R. Olsen 1 Steeler, in C SW SW 20-23s-37e, Lea County, New Mexico. Depth of 2,955 ft. has been reached. The contractor reports that the R. Olsen Oil Co. et al 1 Boyd, in C SW SW NE 23-22s-37e, Lea County, made drill-stem test from 5,540-60 ft. Testing tool was open for 42 minutes, and gas came to top in 5 minutes. Volume is estimated at 5,000,000 cu. ft. per day with volume increasing when testing tool was closed. On the Olsen-Blount Drilling Corp. and Western Gas Co. 1 Eaton, in C SE SE 12-23s-37e, Lea County, casing was perforated from 4,765-95 ft. and acidized with 1,000 gal. Swabbing and testing were continuing. The contractor also reports that the Culbertson-Irwin 1 Gutman, in C SW NE 18-24s-37e, Lea County, spudded February 14.

**Moran Brothers Drilling Co.** was awarded contract by Cities Service Oil Co. to drill a wildcat in Knox County, Texas. The well is 1 Mrs. Doris Mulkey, Section 163, Block 44, H&TC Survey.

**Noble Drilling Co.** has the contract to drill the California Co. 1 Wright, NE NW 13-8s-1w, Love County, Oklahoma.

**B. M. Heath Drilling Co.** will drill the C. A. Lynch 2 Joe Vail, SW SW 14-5s-14w, Posey County, Indiana.

**Comanche Drilling Co.** is digging pits and moving in rotary tools for a test southwest of the Dilworth field for Snowden Oil & Gas Co., Ltd. The well is on Warren Farm, NW 19-28n-1e, Kay County, Oklahoma.

**Independent Drilling and Exploration Co.** has been incorporated under Alberta charter, with head office at Calgary, to handle drilling contracts.

**Ferbanta Drilling Co.,** Oklahoma City, has been organized by D. B. Ferguson, Elsie Ferguson, and W. M. Taylor with a capital of $25,000.

**Bennett Brothers Drilling Co.** has the contract to drill the H. E. Ledbetter 1 C. E. Anderson, SW NE SE 5-6s-9e, White County, Illinois.

**E. F. Moran Drilling Co.** is building road preparatory to drilling Carter Oil Co. 4 Provident Mutual, NE SE NW 14-4s-7e, Hamilton County, Illinois.

**C. E. O'Neal Drilling Co.** is rigging up rotary on the C. P. Chandler 1 J. R. McLin, SE NE SW 32-1s-8e, Wayne County, Illinois.

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## Drillers Hold Safety Meet in Shreveport

A safety conference was held February 13 at the Washington-Youree Hotel, Shreveport, by drilling contractors, tool pushers, and drillers. A field program relating to reducing accident and insurance costs was discussed and definite plans laid for establishing an effective control program. The insurance and safety committee of the American Association of Oilwell Drilling Contractors sponsored the meeting.

An outline of the field program was presented by A. A. Munsch, U. S. Bureau of Mines, Bartlesville, Okla., and R. E. Dishman, Penrod Drilling Co., Shreveport, gave an address on experience with the program in the field. E. C. McFadden, Texas Employers Insurance Association, Dallas, discussed the insurance companies' part in the safety program. Group discussion was led by L. A. Van Fleet, U. S. Bureau of Mines, Dallas. James R. Nowery presided over the 1-day meeting, and J. Doyle Settle, A.A.O.-D.C. committee secretary of Dallas was chairman.

## Exploration for Alaskan Oil to Be Continued

WASHINGTON.—Three companies have been awarded contracts for continued exploration of the Navy's Alaskan oil reserve. They will be aided in their work by U. S. Geological Survey.

Delegate Bartlett, from Alaska, said he had been informed by the Navy that it had awarded a primary contract for exploration to Hoover, Curtis & Ruby, general contractors of New York. That firm had awarded a contract for hauling and moving equipment to Lytle & Green, of Des Moines, Iowa, and a contract for the geophysical work to United Geophysical Co. of Pasadena, Calif.

Bartlett said he was told the contracts were let through negotiations on a cost, plus fixed fee, basis. He said the Navy plans to continue the work on the Arctic reserve with funds already allocated for the remainder of this fiscal year and has asked Congress for funds to continue the work next year.

The Navy previously reported that a well sunk at Umiat Mountain, to the depth of 1,900 ft., had penetrated five separate oil-bearing sands.

The principal camp for the exploration carried on by the Navy men since the spring of 1944 is at Point Barrow with secondary camps at Umiat Mountain and Cape Simpson. The exploration has been limited to the eastern third of the reserve and the Navy recently announced it intended to expend it to the remainder of the land.

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# PERSONALS

## Sohio Vice President Began as Station Operator

EDWARD F. MORRILL, recently appointed vice president of Sohio Pipe Line Co., began his career in the oil business in 1932 as a service-station operator in Akron, Ohio, for the parent organization, The Standard Oil Co. (Ohio). That was after he had graduated with honors from Case School of Applied Science.

Morrill was born in Columbus. Following a short stretch in his Akron job, which was part of the breaking-in experience he wanted, the young man successively held the positions of bulk-station clerk, transport-truck dispatcher, clerk in the refined-products distribution department, engineer and later chief engineer in the pipe line department. He has been serving as assistant manager of transportation operations for Sohio Pipe Line Co., with headquarters in the St. Louis office. He will carry on the duties of the last-named position in addition to those of vice president.

Sohio Pipe Line Co. operates in six states as a common-carrier crude-oil pipe line.

**K. B. Ross,** deputy works manager of the Abadan, Iran, refinery, Anglo-Iranian Oil Co., Ltd., is visiting the New York offices of the company. Before his return to Iran, he expects to visit several refinery centers in the United States.

**J. Pickens Coleman,** Wichita Falls oil operator, has been elected president of the North Texas Oil and Gas Association succeeding **Ed G. Kadane.**

**E. B. Clark** was named vice president, and **Fred Sehmann** executive vice president.

**Charles Visser** has been transferred by Royalite Oil Co. from Turner Valley to Norman Wells, in the Northwest Territory, where he will take over the work of **Walker Taylor,** returning to Calgary on account of ill health.

**W. K. Link,** chief geologist of Tropical Oil Co., left Colombia to attend a meeting in Miami February 7-15, at which executives of Standard Oil Co. (New Jersey) and its subsidiaries discussed domestic and foreign operations.

**Harrison B. Loomis,** Carter Oil Co. engineer, has been transferred from Rock Springs, Wyo., to Kemmerer, Wyo. **Eben Magoffin, Jr.,** who recently returned to Carter as gravity meter engineer following service in the Marine Corps, has been made a gravity meter party chief and transferred from Tulsa to Ruston, La.

**Harry H. Arnold, Jr.,** production superintendent for The Texas Co. in the Illinois-Indiana-western Kentucky district, has been awarded a Legion of Merit for outstanding work as a lieutenant colonel in the Army Corps of Engineers. Arnold, who recently returned to the company, was cited in connection with establishment of practical training sites while he was chief of the department of pioneer instruction at Fort Belvoir, Pa.

**J. H. Graham,** who joined Continental Oil Co. last October after serving with Petroleum Administration for War, has been made assistant manager of production and drilling east of the Rocky Mountains. He will direct and coordinate unitizations in producing fields in all regions and will work with the company's natural gas and gasoline divisions with headquarters in Houston.

**R. C. Tuttle,** chief geophysicist for Sunray Oil Co., has resigned after 2 years' service with the company.

**Don Brown** and **Victor H. Munnecke** have been appointed control engineers by Lone Star Gas Co. to assist **Thomas S. Bacon,** technical research engineer. Brown, formerly inventory engineer, returned to the company in January after service in the Army. Munnecke formerly was assistant to the research engineer of North American Aviation Co.

**Dr. John B. Entrikin,** head of the chemistry department of Centenary College, Shreveport, has been elected 1946 president of the Ark-La-Tex Chemist Club. **Guy Mitchell,** chief chemist for Ozark Chemical Co., was named vice president, and **D. N. Barrow,** assistant superintendent of the natural gas division of Arkansas Fuel Oil Co., secretary-treasurer.

**E. G. Hammerschmidt,** chief chemist of Texoma Natural Gas Co., is the newly elected chairman of the Panhandle Plains Section of the American Chemical Society which represents 24 counties in northwest Texas and one in New Mexico. Hammerschmidt succeeds **Emmett B. Reinbold** of J. M. Huber Corp.

**Wayne P. Campbell,** formerly field auditor for the Oklahoma Corporation Commission; **G. W. Michaels,** recently discharged after 3 years' service in the Army; and **Ted A. Smith,** also recently separated after Army service, have been added to the staff of the Independent Petroleum Association of America as field representatives.

**M. W. Young** has resigned as district land man for Houston Oil Co. to join J. M. Hancock, Houston, as an independent operator.

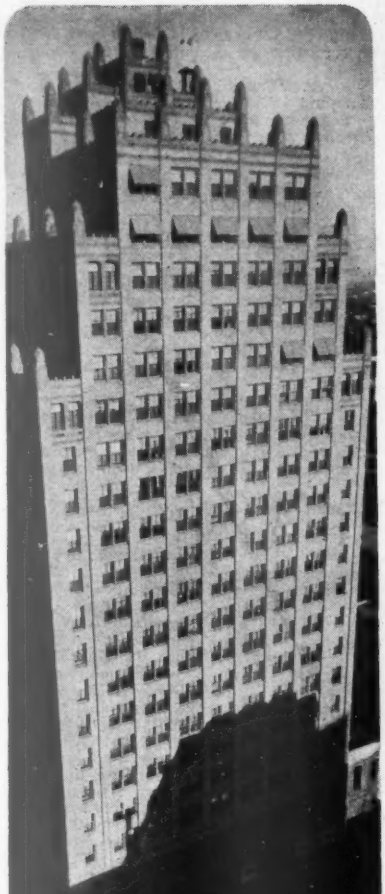
**R. H. Dana** has joined the Southern Geophysical Co. of Fort Worth as manager of its Nacogdoches office.

**Jim Donelan,** with Core Laboratories, Inc., has been transferred from Dallas to Oklahoma City.

**Reginald H. Evans,** general manager of Socony-Vacuum Oil Co.'s central European division, arrived in New York February 10 from London. During the war Evans was vice chairman of the Middle Eastern board of directors of the United Kingdom Commercial Corp. and as such aided in expediting material to the Russians.

**Paul E. Taliaferro,** former vice president of Sunray Oil Corp. who was recently discharged as a major in the Army, has been elected vice president and general attorney to serve until the next election of officers.

**Riley A. Aucoin,** Humble Oil & Refining Co., has been elected chairman



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JOE T. O'KEEFE, President

of the East Texas chapter of the American Institute of Mining and Metallurgical Engineers.

**John D. Moorehead,** recently discharged from the Navy, has been appointed district geologist for Continental Oil Co. with headquarters in Wichita Falls.

**Gerald B. Siler,** Carter Oil Co. field geologist, has been transferred from Seminole to Oklahoma City.

**Allen A. Jergins,** vice president of Jergins Oil Co., is the new president of the San Joaquin Valley Oil Producers Association. Jergins, elected at a recent meeting in Bakersfield, succeeds the late Dana Hogan, organizer of the association. Assisting Jergins are **Fred Owens, William Keck, Jr., C. C. Spicer, William Whaley, Harold Pauley, Richard Fenton,** and **Charles Premo** as directors. Premo was reelected secretary. The association enlarged the board to include representatives of drilling contractors and equipment companies.

**L. E. Olinger,** Los Angeles, has been elected president of Petromont Corp., succeeding **Gene Reid,** who recently resigned.

**Walter E. Helmick,** who has been senior engineer in the mechanical engineering department of Shell Oil Co., Inc., has been advanced to senior exploitation engineer at Los Angeles.

**K. C. Crandall,** New Orleans, president of California Co., subsidiary of Standard Oil Co. of California, has returned from an inspection of the company's operations in the Rocky Mountain area, predicting a rich future for oil operations in Colorado. The company is a major operator in the Rangely and Wilson Creek fields.

**Edward W. Isom,** vice president in charge of research and development of Sinclair Refining Co. for more than 20 years, has received a citation from Stevens Institute of Technology for notable achievement in the oil industry engineering field, specifically in production and refining of gasoline and lubricating oil. He is a graduate of Colorado School of Mines, class of 1907.

**W. F. Bowser** has been named chief geologist of Sunray Oil Corp. with headquarters in Tulsa. **Sherrill A. Shannon,** assistant geologist for Sunray in Kansas, has succeeded Bowser as district geologist in the company's Wichita office.

**W. A. Thomas,** former geologist for the Ohio Oil Co. in Michigan, has rejoined the company as district geologist at Midland, Tex., in charge of the West Texas-New Mexico area following his release from the Army as a lieutenant colonel.

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# Equipment Men in the News

## Davidson Named Sales Manager Of W. C. Norris, Manufacturer

G. W. DAVIDSON

Appointment of G. W. (Bill) Davidson as sales manager of W. C. Norris, Manufacturer, Inc., is announced by J. H. Eustice, president. Davidson has been with the Norris organization 10 years. He has served as sales representative in East Texas, Illinois, and Wichita Falls territory. He returned to Tulsa in 1944 and has been in charge of city sales.

## Reams Organizes Supply Company at Alice, Tex.

Henry E. Reams, Corpus Christi, Tex., has organized Reams Supply Co., and has opened a warehouse and office at Alice, Tex. Reams announces that he will be able to take in the oil producers and drilling contractor's used material on new material.

This new firm will be a distributor for the following manufacturers in South Texas territory: The Brewster Co., Inc.; Web Wilson Oil Tools; Manhattan Rubber Co.; Wickwire-Spencer Steel Co.; Waukesha Motor Co.; Continental Motor Corp.; Mission Manufacturing Co.; Hacker Machinery & Supply Co.; Kinzbach Tool Co., Inc.; Texas Iron Works.; Acorn Refining Co., and other well-known manufacturers' products.

A branch store will also be opened in San Antonio, at 401 Simpson Street, and additional branches will be opened in South Texas as soon as materials and stocks are available.

## Corry Will Represent Franks in Midwest

Stuart E. Corry has been appointed sales representative of Franks Manufacturing Corp. of Tulsa in the states of Illinois, Indiana, Michigan, and the western portion of Kentucky. He will maintain his office at Fairfield, Ill. Corry joined Franks in 1943, with an extensive experience in the engineering field, having come directly from the Spartan Aircraft Co. where he was chief tool engineer.

## Downing Joins Cook Electric Engineering Staff

James R. Downing has been appointed director of research at Cook Electric Co., Chicago, Ill., according to Walter C. Hasselhorn, president.

## West Goes to Midland for Mid-Continent Supply Co.

W. I. (Ike) West has been transferred from Houston to Mid-Continent Supply Co.'s division offices in the Petroleum Building, Midland, Tex., where, as division manager, he is in charge of the company's extensive operations in the West Texas-New Mexico territory.

## Edwards in South America For Oil Center Tool Co.

Jack Edwards, vice president and sales manager for Oil Center Tool Co., Houston, arrived in Caracas, Venezuela, January 13. While in South America, Edwards expects to visit fields in eastern and western Venezuela and Colombia.

## Pittsburgh Equitable Meter Co. Becomes Rockwell Mfg. Co.

The name of Pittsburgh Equitable Meter Co. has been changed to Rockwell Manufacturing Co. The company continues under the same management and its home office remains at 400 North Lexington Avenue, Pittsburgh, Pa. Simultaneously, certain changes were made in the names of the following wholly owned subsidiaries of Rockwell Manufacturing Co.: Merco Nordstrom Valve Co. became Nordstrom Valve Co.; The Edward Valve & Manufacturing Co., Inc., became Edward Valves, Inc.; Pittsburgh International Corp. became Rockwell International Corp.; H. A. Smith Machine Co. became Rockwell Machine Co.

## Tube Turns Promotes Two

John G. Seiler, vice president and general manager of Tube Turns, Inc., Louisville, has announced the appointment of

JACK GREEN

TOM PIKE

Jack Green as sales manager of the welding fittings division. Green joined Tube Turns in February 1941, and was stationed in Chicago as district manager, before becoming the division's assistant sales manager in June 1943.

Succeeding Green as assistant sales manager of the welding fittings division is Tom Pike, who joined the company in the Los Angeles office, in January 1940. He subsequently became district manager in charge of the West Coast territory.

## Dresser Holds Annual Sales And Engineering Conference

Over 100 executives, salesmen, and engineers of 8 of the 14 member companies of Dresser Industries, Inc., met in their fourth annual sales and engineering conference at the Baker Hotel, Mineral Wells, Tex., January 13 to 16. Eight tons of various types of equipment for the oil and gas industries, representing Dresser products designed and engineered for these fields, were displayed at the conference, illustrating the breadth of range of the services of the Dresser member companies represented at the conference.

Subjects discussed included research programs and sales plans of each of the member companies, and the over-all development program of Dresser Industries as a whole.

Chairman of the conference was John B. O'Connor, executive vice president of Dresser Industries, Inc.

## Adams Named National Tube Development Director

O. P. Adams has been appointed director of development for National Tube Co., according to E. H. Sanders, vice president in charge of operations. He has been assistant general superintendent of the company's National Works, McKeesport, Pa. Also announced is the appointment of T. H. Kennedy as assistant general superintendent at National Works and the retirement of J. Jay Dunn as assistant to vice president of operations.

## Thomas Elected Vice President Of Arcos Corp.

R. David Thomas, Jr., director of research and engineering of Arcos Corp. since 1940, has been elected vice president. In addition to teaching courses in the metallurgy of welding at Drexel Institute and Temple University, Thomas has written numerous articles for the technical press, and has delivered a number of talks before the American Welding Society and other technical societies on subjects relating to the welding of stainless alloys.

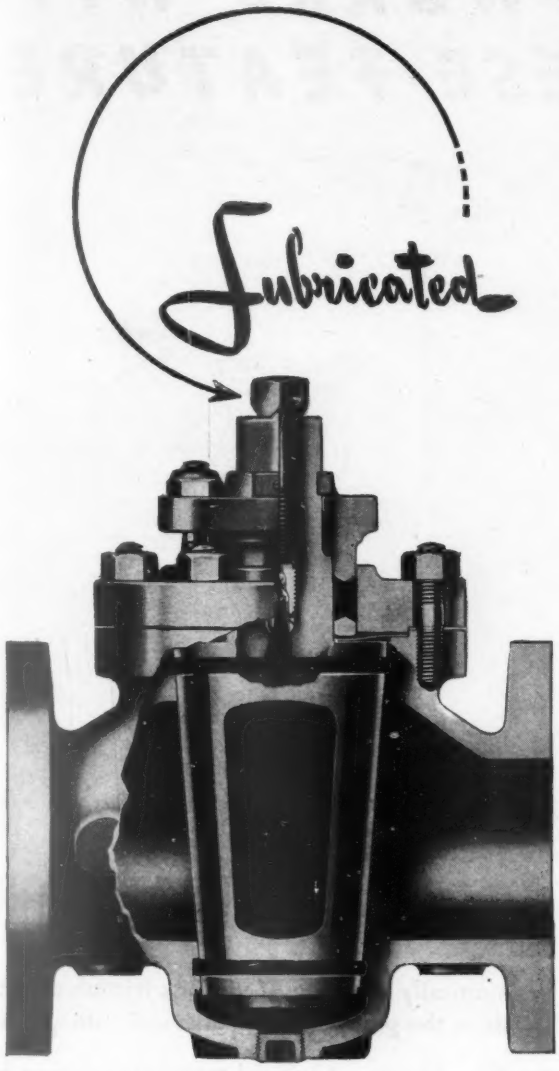
## Moomaw Appointed General Manager of Armco's Rustless Division

Announcement of the appointment of G. D. Moomaw as general manager of the Rustless Iron and Steel Division of American Rolling Mill Co. has been made by Charles R. Hook, president. Moomaw was vice president and general manager and a director of Rustless Iron & Steel Corp. which has been merged with Armco. Appointment of C. R. Hook, Jr., as assistant to the general manager of the Rustless Iron and Steel Division also was announced. Frank Buffo, who has served as production manager at Rustless since coming with the company in 1930, has been named manager of stainless bar and wire sales of the Rustless Iron and Steel Division. E. P. Geary, former assistant vice president in charge of sales, has resigned.

## Roberts Elected Vice President Of Sterling Engine Co.

R. J. ROBERTS

Sterling Engine Co. has announces that Comdr. Russell J. Roberts, U. S. Coast Guard, has been elected as assistant to the president to fill the vacancy created by Edward M. O'Connor who retired on January 1, after serving 29 years with the company. Roberts is now on terminal leave and has resigned his commission with the Coast Guard to accept this appointment.

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Walworth Lubricated Plug Valves are available in sizes ½" to 24" for pressures from 125 to 5,000 psi, and for vacuum requirements. These valves are being used successfully on lines carrying gases, air, water, oil, gasoline, chemicals, acids, solvents, and so on. For further information about Walworth's complete line of lubricated plug valves, write for Catalog No. 44L.

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- ★ **Hydromatic brake is available for installation on lower drum shaft.**
- ★ **Optional sand line drum assembly mounts on countershaft, making a double drum draw works.**

CARDWELL ALLSTEEL

THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

**CARDWELL MFG. CO. INC.**

FORMERLY ALLSTEEL PRODUCTS MFG. CO.

P. O. Drawer 2001 Cable Addresses ALLSTEEL WICHITA - CARDSTEEL NEW YORK

Wichita, Kansas, U. S. A.

**INDUSTRIAL KANSAS**

Has large pool of trained, strike-free workers—15¢ natural gas and 1¢ kwh power, low-cost living.

WE WELCOME YOU TO KANSAS

# He's making it swallow its own tail

*A typical example of B. F. Goodrich development in rubber*

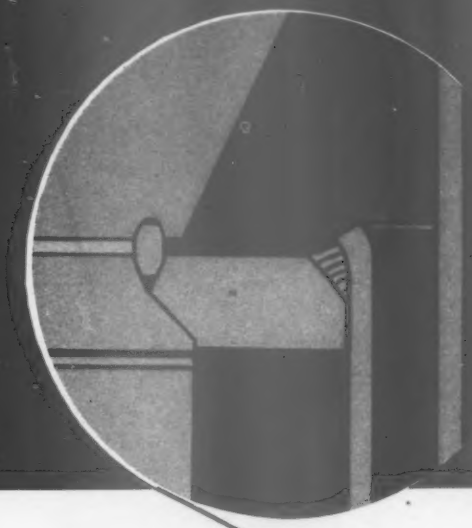
FOR years, belts were a terrible headache in paper mills — as well as a lot of other places. Metal fasteners, laces and other devices were used to join the two ends of the belt and make it endless. But the belts tore loose at the joints, slipped on the drive, failed to transmit power. Then the machinery had to be stopped while a new joint was made — sometimes as often as every 10 days.

Then B. F. Goodrich engineers developed a way to make each end of the belt a part of the other end. It's called the Plylock Belt Joint because the plies of rubber and fabric are actually locked together by overlapping, then vulcanized to make the joint permanent. The result is a joint that is 3 times stronger than metal fasteners; that will outlast them by as much as 10 times. Shutdown time for the machinery is sharply cut, production materially increased.

This is a typical result of the research and development that is always under way at B. F. Goodrich — on new products and old, for every industry. From tiny grommets to huge oil hose, from vibration dampeners to coal conveyor belts, no product is ever considered "standard" at B. F. Goodrich. Your supplier will be glad to work with you on any problem involving the use of rubber products by B. F. Goodrich. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

**B. F. Goodrich**

RUBBER *and* SYNTHETIC *products*



# PROVED APPROVED IMPROVED

# RECTORHEAD

## WELDED SEAL

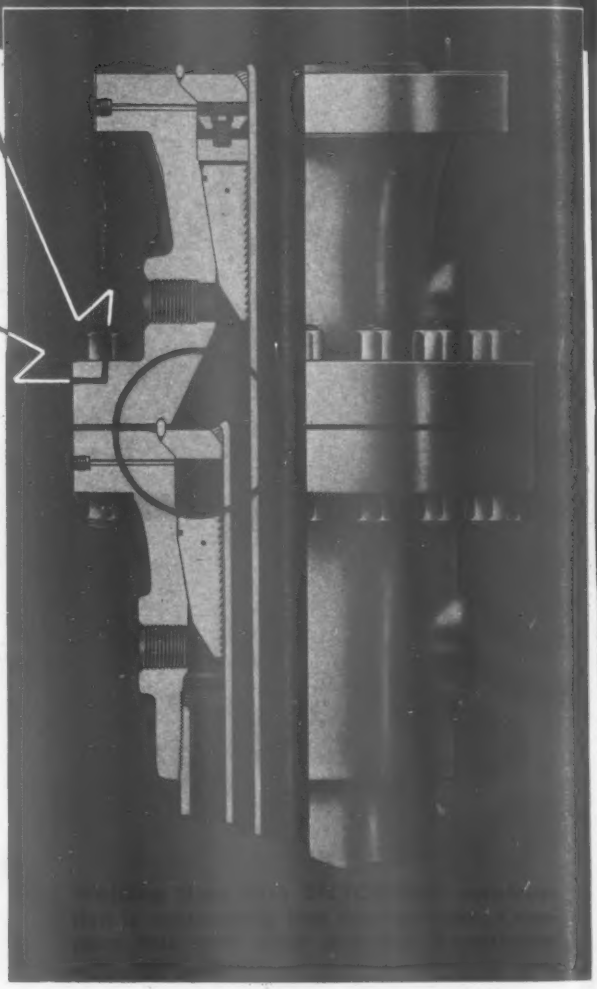
Don't compromise with safety . . . don't sacrifice strength and permanence in your casing head hook-ups. A good weld plus the API ring is recognized as the most effective means of sealing between strings of casing. RECTORHEAD construction brings this method to its highest form of efficiency and simplicity.

Field-proved by years of successful performance on thousands of wells, RECTORHEAD welding has been approved by scores of operators in fields throughout the world. Improvements over the years further simplify installation and increase safety, strength and permanence.

With RECTORHEAD, any grade of pipe can be successfully welded. During welding the ring is allowed to "float," permitting natural expansion of both casing and ring, preventing stresses being welded-in. No opposing forces, such as bolt pressure, are ever applied to weld or ring, because the ring sits down on a definite seat within the head so that it cannot be distorted when API flange bolts are tightened.

No packing is used or needed for a seal between strings with RECTORHEAD construction. A weld-test-pack-off is available for insertion between slips and welding ring if operator desires to make pressure test of weld in the field.

REMEMBER IT'S THE DESIGN TO WHICH WELDING IS APPLIED THAT ASSURES SAFE, STRONG, DEPENDABLE WELDED SEALS. WHEN YOU HOOK-UP YOUR WELLS, USE RECTORHEAD.



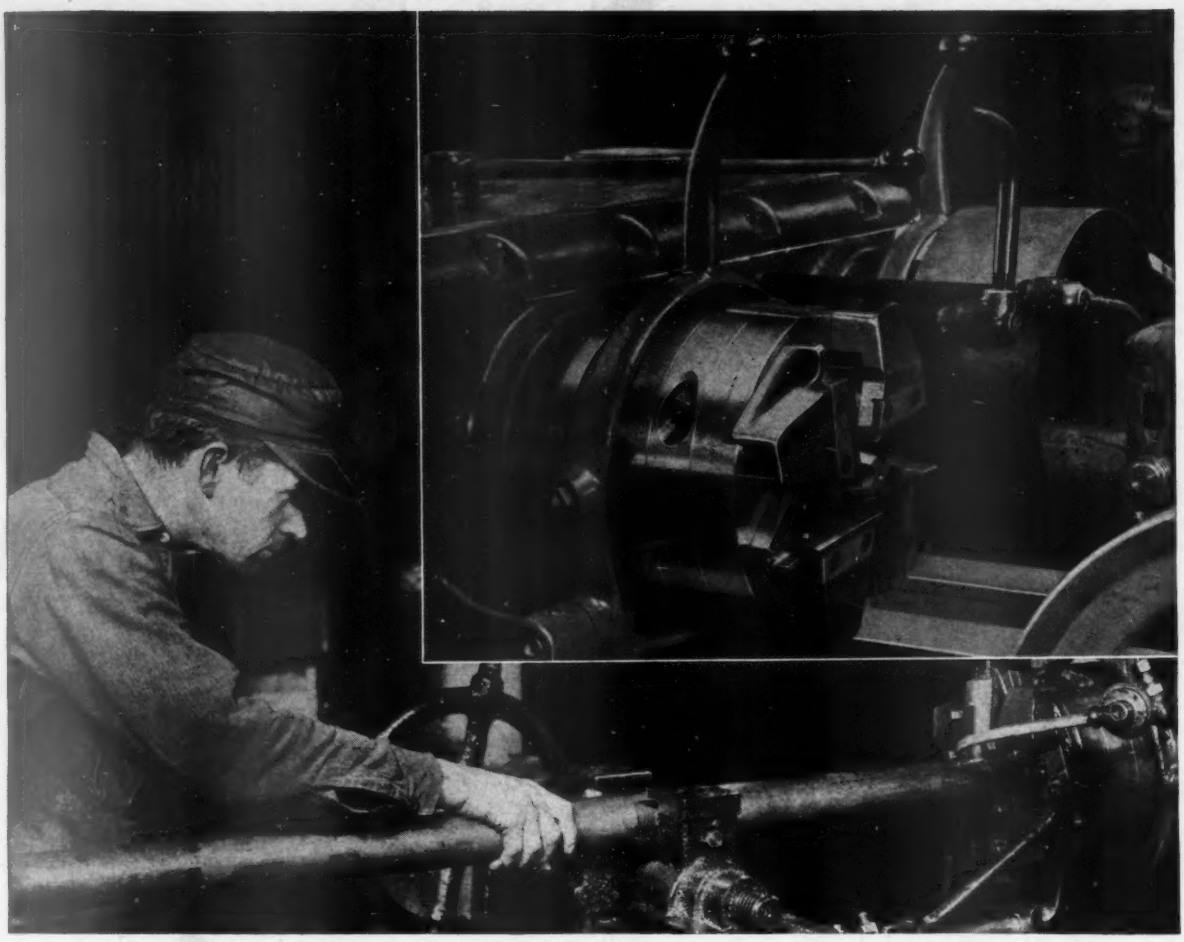
**RECTOR**
**WELL EQUIPMENT CO., INC.**
**FORT WORTH, TEXAS**
*Export:* Lucey Export Corp., Woolworth Bldg., N. Y. C.
Representatives in all active fields

RECTOR

RECTORHEAD

MAKING THE OIL INDUSTRY SAFER!

ASSOCIATION OF WELL HEAD CERTIFIED Equipment MANUFACTURERS



# WHERE PRODUCTION COUNTS—
## USE THE LANCO DIE HEAD

The results obtained by one tubing manufacturer using the Lanco Head (Internally Tripped Type) for threading Wrought Iron Pipe Products is typical of results obtained everywhere with Landis Thread Cutting Equipment.

Threading 2 inch Regular Wrought Iron Pipe, this LANCO Die Head, operating at a cutting speed of 60 feet per minute, averages 150 threads per hour. Threads are held to close tolerance specifications.

Such performance explains why leading manufacturers throughout the world . . .

**. . . LANDISize their THREADS**

**Investigate LANCO Internally Tripped Heads for your Threading Operations — *Write for Bulletin No. D-67.***

*Represented in the Domestic Oil Fields by:* Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

**LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.**

THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS

A "Caterpillar" Diesel D8 Tractor moves a mud pump mounted on a track-type trailer to a new location in a California field.

# Just say where!

YOU can get heavy equipment moved where you want it in a hurry with a "Caterpillar" Diesel D8. Plenty of power on the drawbar. Plenty of traction for rough or slippery footing. Roads or no roads, rain or shine, the D8 will take your machinery to the next drill site when it's time to move.

This brawny tractor keeps busy between times, too. With a bulldozer on the front end it handles the rough grading on roads, digs slush pits, builds fire walls and does any other earthmoving jobs that come along.

It's a money-saving, time-saving tool on any oil-field operation, and its steady-running, dependable power and long life are backed by the most efficient dealer service organization in the business.

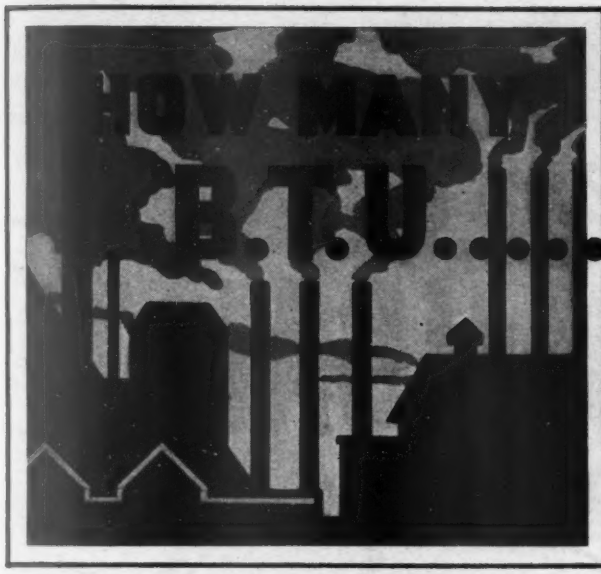
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

*The discharged veteran wears this emblem. Remember his service and honor him.*

# CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT



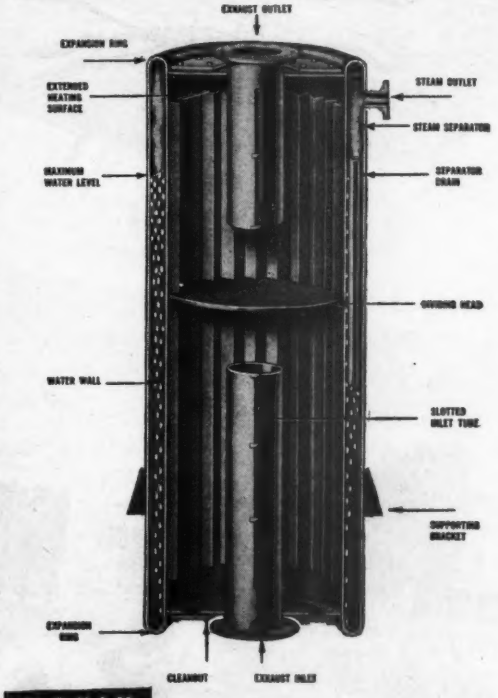
# ...go up the flue?

## YOU CAN SAVE THIS HEAT WITH MAXIM HEAT RECOVERY SILENCERS . . .

In any operation where Diesel power is used, an important amount of usable heat goes out the exhaust pipe and is totally wasted. This heat, transformed into steam or hot water, could in most cases be used to good advantage . . . without a cent of added fuel cost.

Maxim Heat Recovery Silencers make this possible. They are efficient silencers and, where necessary, spark arrestors. But, in addition, they provide for the recovery of waste exhaust heat to produce steam or hot water for heating or processing operations. Automatic controls are available to control steaming rate, and these silencers may, due to their special construction, be run dry without harm to the unit.

Maxim Silencers without the heat recovery feature are available for effective silencing of internal combustion engine exhaust or intake, steam engine exhaust, air compressor intake, vacuum pump discharge, blower intake and discharge. Engine exhaust silencers available with or without spark arrestor.



**Heat Recovery Silencer Bulletins WH-100, WH-102 and WH-103 will be sent promptly on request.**

**THE MAXIM SILENCER COMPANY • 98 HOMESTEAD AVE., HARTFORD 1, CONN.**

ARMY E NAVY

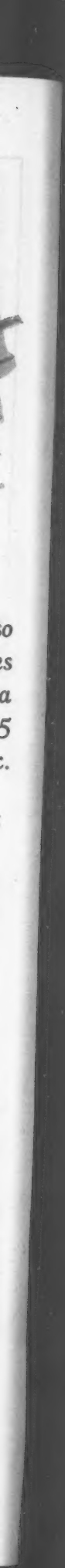
# they're ECONOMICAL

*THE battery of five Gaso Pumps shown in the illustration operates 24 hours a day to keep things moving in a midwestern pipeline. Each unit pumps 225 barrels per hour, at a fuel cost of about 30c.*

The economy of Gaso pumps has long been recognized by canny operators—and verified by their cost records. It is a result of fine engineering, precision manufacture and efficient application of power units.

To say "Gaso" is such a simple way to get the most in pumping economy... Gaso Pump & Burner Mfg. Co., 902 East First St., Tulsa, Okla. Export Office: 149 Broadway, New York. Shreveport: W. L. Somner Co., 419 Lake Street. Los Angeles: Production Equipment Co., 651-653 E. Gage Ave.

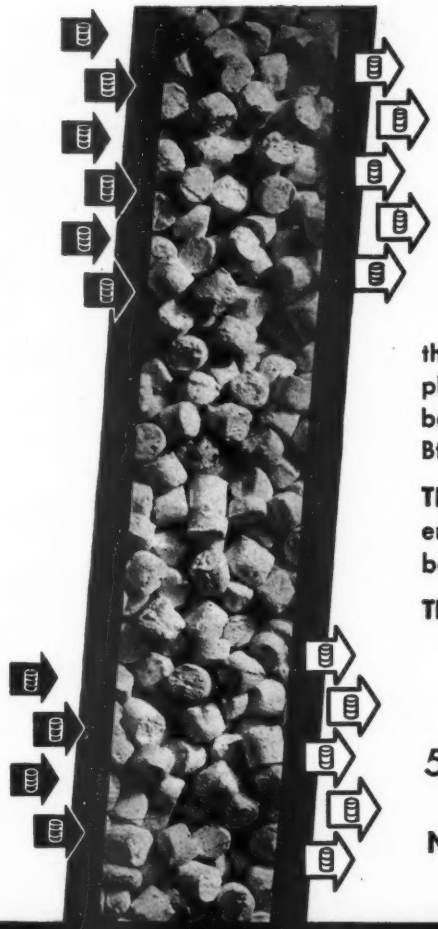
**GASO PUMPS**
*for every oil industry need*



....FLASH...AT CURRENT PRICES DOUBLE BONDS (=) OF THE C-4-H-8 CLASS ARE CONVERTIBLE AT SUBSTANTIAL PROFIT...FOR FURTHER INFORMATION INVESTIGATE....

PHOSPHORIC-ACID

# polymerization



6 barrels of Butylene
polymerize to
5 barrels of Polymer

**HOWEVER-**

the alternate disposition of excess butylene is plant fuel—and—6 barrels of butylene, on a Btu basis, is equivalent to but 4 barrels of a standard Btu fuel oil.*

**THEREFORE,** if the 6 barrels of butylene are polymerized, they would have to be replaced with 4 barrels of standard fuel oil.

**THEREFORE,...**

4 barrels of fuel oil
is converted into
5 barrels of high-octane polymer

**NET VOLUMETRIC CONVERSION 125%**

*6,300,000 Btu per barrel

THAT IS WHY *PHOSPHORIC ACID POLYMERIZATION PAYS OFF FAST!*

FOSTER WHEELER

# Polymerizing

## 9,000 barrels per day of BUTYLENE

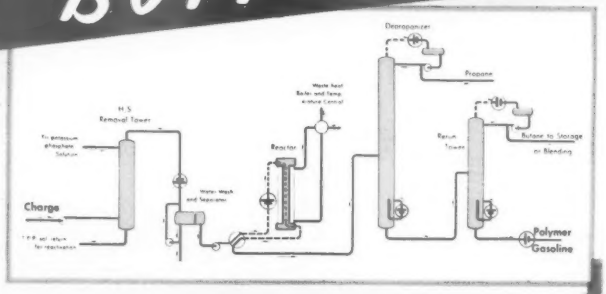
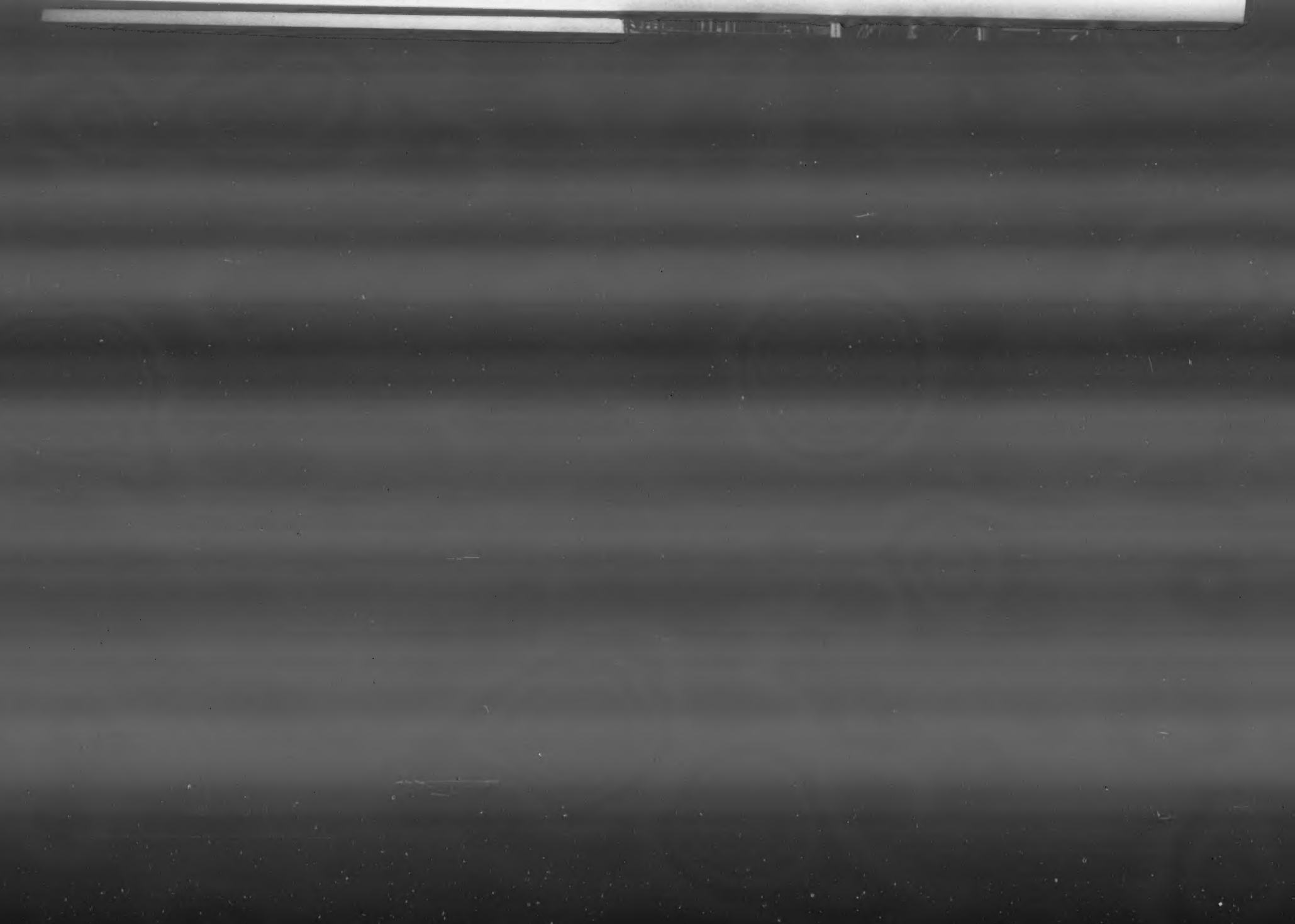



**EXHIBIT "A"....." EVIDENCE FOR ECONOMY"**

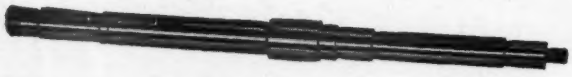
**One of the largest in the world, this high-pressure selective Phosphoric Acid Polymerization unit ran for over three years before shutdown was necessary due to temporary shortage in charging stock.** ***(Designed and constructed by Foster Wheeler)***

FOSTER WHEELER

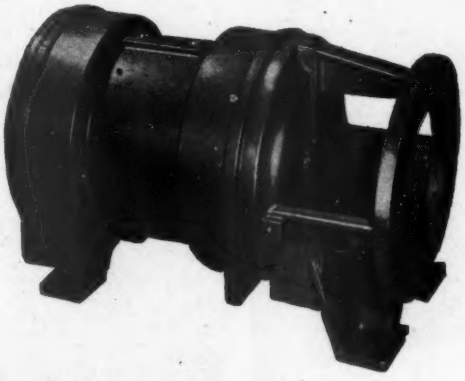


# Two Clues

## to Why A-C's Smooth-Running Electrifugal Pump is the Finest of its Kind!



**Clue No. 1:** One-piece shaft carries motor-rotor and pump-impeller on ball bearings—assures alignment and smooth operation. Cast bronze sleeve shields it from liquid being pumped.



**CLUE No. 2:** One-piece iron casting forms motor yoke, the bearing housing, pump bracket and feet—gives stability to entire unit. Saves 33% space, lessens chance of strain on parts or piping.

FINE ENGINEERING adds up to quality and value—and that's what Allis-Chalmers "Electrifugal" Pump now offers you! Entire unit is designed for efficient, dependable service—gives you maximum protection against dangers of abnormal wear, leakage, corrosion, vibration. For further information call our nearby office, or write ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 1929

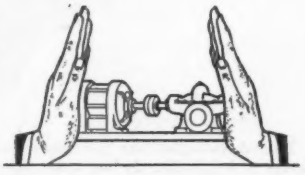
**HEAR THE BOSTON SYMPHONY:** *Every Saturday Evening, American Broadcasting Co*

## OIL COMPANY BUYS 100 *Electrifugal* PUMPS

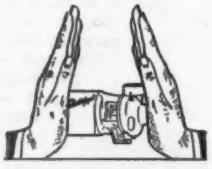
TO MOVE volatile liquids such as gasoline, kerosene, naphtha from tank-car to storage tank, and into trucks—a large petroleum company depends on A-C Electrifugal Pumps. Try-out of first 15 pumps was so successful (big test: surge-shock when valves snap shut!), 100 units were ordered, more later re-ordered.

Electrifugal Capacities: 15 to 1600 gpm—heads up to 500 feet.

### SQUEEZE PLAY CUTS PUMP SPACE 33%



How can we couple a pump and motor together *better*—to save space, provide stability, rigid alignment?



Electrifugal Design assures alignment and smooth operation, cuts space 33% — gives you greater pumping efficiency for your money!

# ALLIS-CHALMERS *Electrifugal* PUMPS

# COME WHAT MAY—THIS DRAWWORKS IS CHAINED UP TO DRILL A LOT OF HOLE!

● This drawworks has just been fully reconditioned. It has many deep wells to its credit. It has many more on schedule, and is ready to get back on the job.

Among the owner's specifications is Link-Belt Self-Lubricating 3-Bar Hyper Chain, one of Link-Belt's heavy-duty rotary chains which, thanks to unfailing performance under hardest drilling conditions, are standard drives among so many operators.

Improvements brought to the field by this dependable chain include the patented oil-grooved drop forged side bar which permits free entry of oil to joint and bearings. With this exclusive feature in design go the research, the engineering, the quality materials and the know-how workmanship that have characterized Link-Belt Chains through 70 years of continuous improvement. Yes, come what may, this drawworks is chained up to drill a lot of hole, regardless of speed, depth, or load requirements.

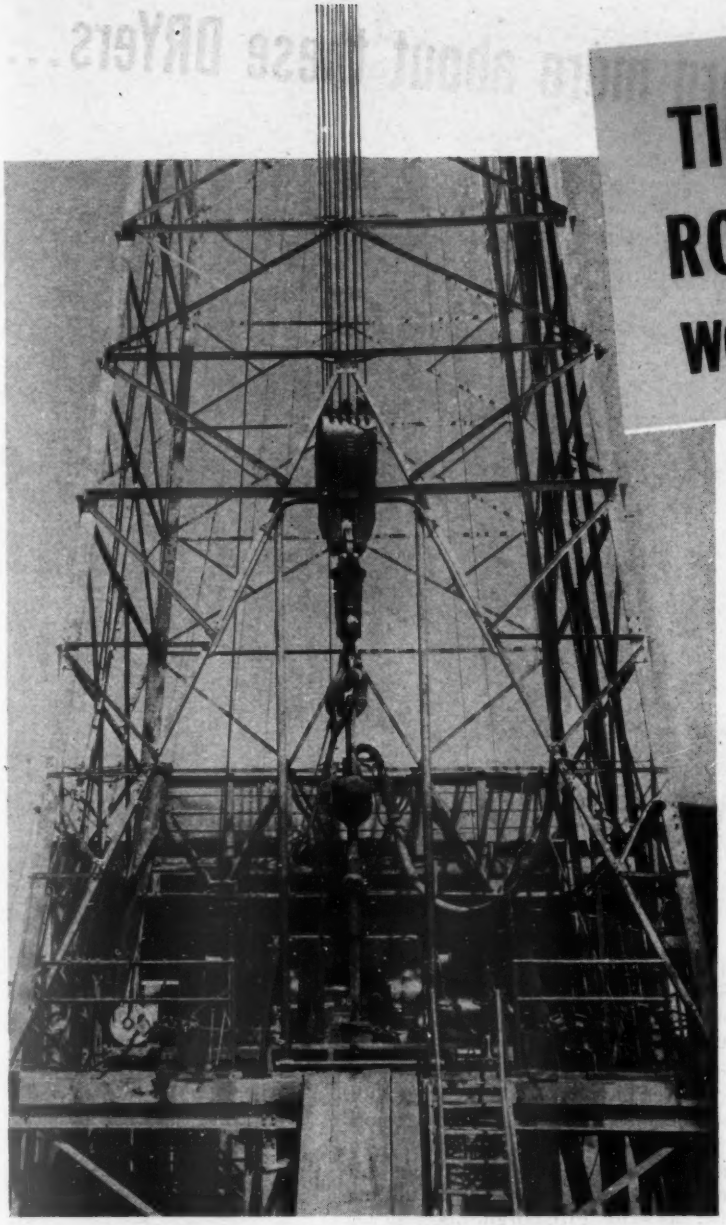
9962

**LINK-BELT COMPANY**

Indianapolis 6, Dallas 1, Houston 2, Los Angeles 33, Kansas City 6, Mo., New York 7, Toronto 8.
Distributors in all fields.

Also manufacturers of silent chain drives, roller chains, roller and ball bearings, and other transmission equipment, mud screens and cranes.

**LINK-BELT CHAINS** . . . a Type for Every OIL INDUSTRY SERVICE



# TIGER BRAND ROTARY LINES WORK IN QUICKLY

YOU begin saving time and money almost from the minute you string up your rig with U·S·S American TIGER BRAND Excellay Preformed Rotary Lines.

Strong and tough, these flexible, easier-to-work-with lines need less breaking in. They're all set to handle any load speedily, smoothly, safely from the beginning. They practically give top performance first trip in the hole.

Excellay TIGER BRAND Rotary Lines run true in the grooves of sheaves and wind snugly on the drum. Their preformed construction means that each strand of wire in the line bears its full share of any stress. Thus, bending fatigue is reduced to a minimum. And the extra tough steel used reduces abrasive wear.

For greater drilling efficiency . . . for longer rotary line life, equip your rigs with TIGER BRAND. It's the best known, biggest selling brand in the oil industry. See your nearest TIGER BRAND dealer now.

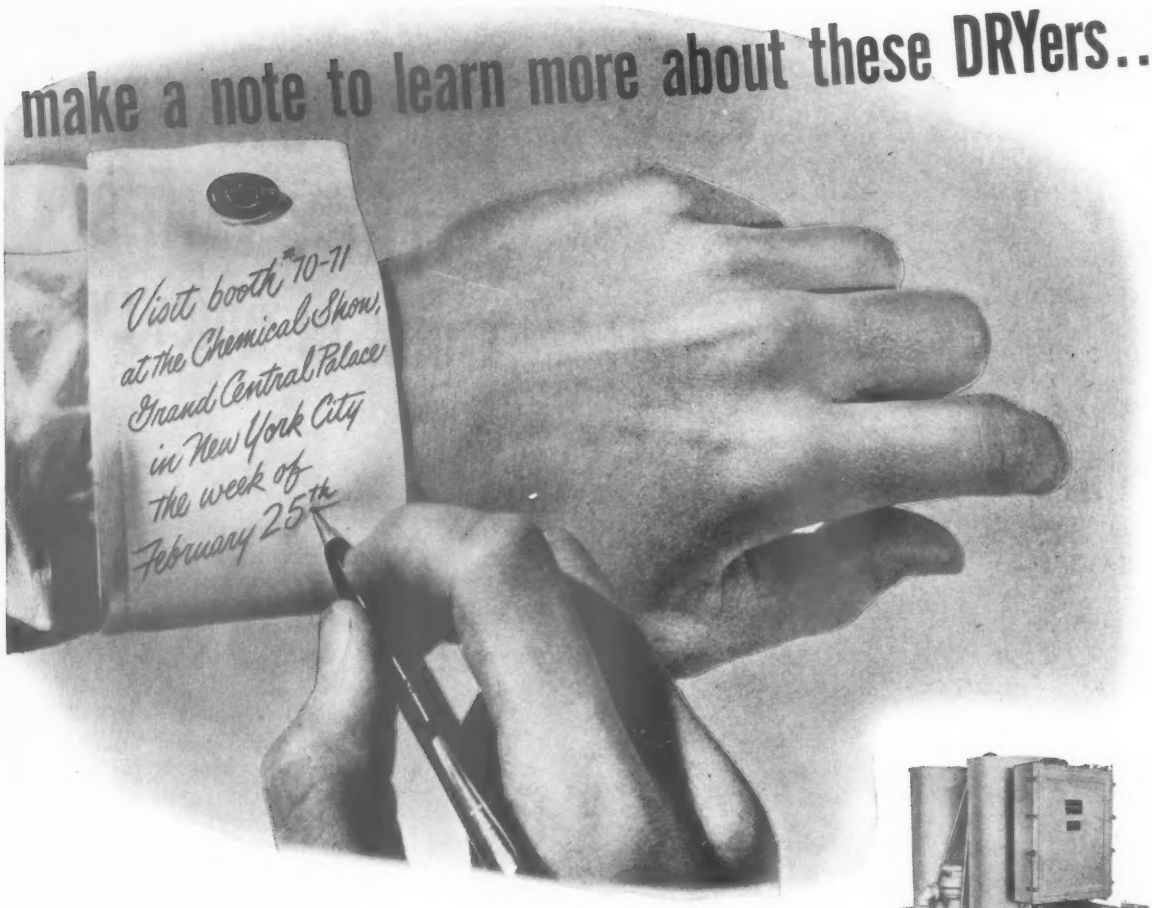
*Excellay Preformed*

**EVERY SUNDAY EVENING,** United States Steel presents *The Theatre Guild on the Air.* American Broadcasting Company coast-to-coast network. Consult your newspaper for time and station.

**AMERICAN STEEL & WIRE COMPANY**
*Cleveland · Chicago · New York*
**COLUMBIA STEEL COMPANY,** *San Francisco*
United States Steel Export Company, New York
**UNITED STATES STEEL**

U·S·S AMERICAN
**TIGER BRAND** *Wire Rope*

# make a note to learn more about these DRYers...

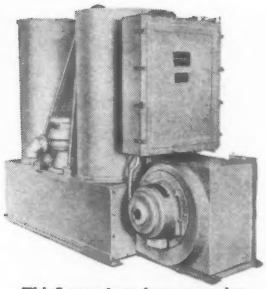



Dehumidification of inactive naval vessels and merchant ships, and the control of humidities in storage warehouses—these are the important tasks assigned to these two types of Lectrodryers. Hundreds are being built and shipped all over the country.

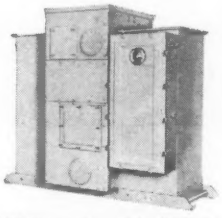
Relative humidities of 30% or lower are automatically maintained with the help of these DRYing machines. Ships will be kept ready for service on short notice. Materials will be preserved against corrosion, mildew, rust or rotting.

Lectrodryers will perform similar service for you, DRYing air, gases and many organic liquids to low dew-points. Learn more about them by talking with our men at the Chemical Show, or write Pittsburgh Lectrodryer Corporation, 325 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham. In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.



This Lectrodryer has a capacity of 500 cubic feet per minute.



This Lectrodryer dries 150 c.f.m.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

PITTSBURGH

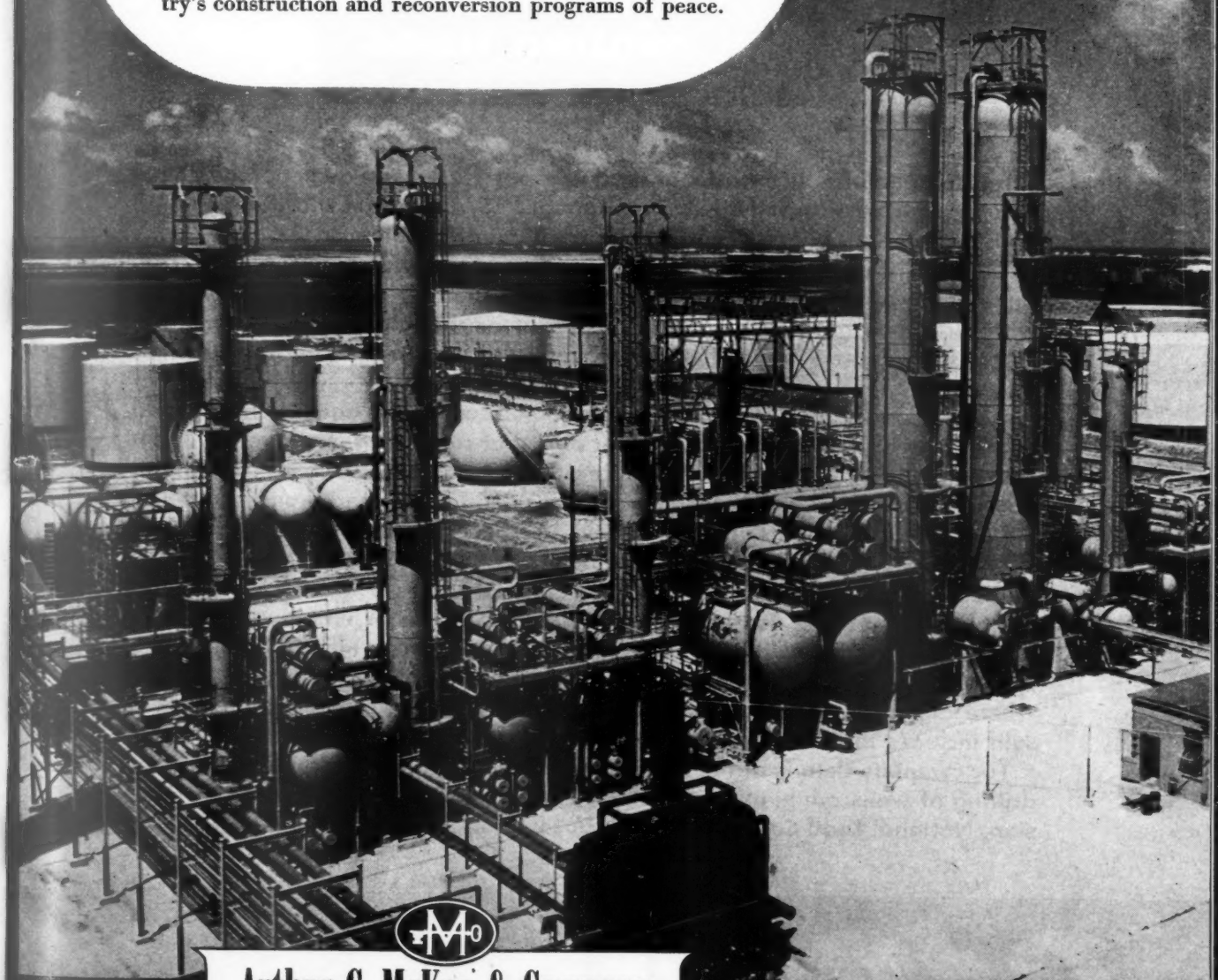
# LECTRODRYER

Reg. U.S. Pat. Off.

CORPORATION

UNDIVIDED RESPONSIBILITY IN ONE ORGANIZATION

WITH many years of experience in refinery engineering on a world-wide scale, the McKee organization was well prepared for war. Today, with an enlarged staff and added know-how gained in wartime activities, McKee is even better prepared for the Refinery Industry's construction and reconversion programs of peace.



**Arthur G. McKee & Company**

★ *Engineers and Contractors* ★

2300 CHESTER AVENUE · CLEVELAND, OHIO

# Announcement

**U. S. PATENT NO.**
**2,393,165**
**TREATMENT OF**
**WELL DRILLING FLUIDS**

This is to announce that National Lead Company is the sole owner of the above patent, which has just issued, i.e., January 15, 1946, and that Baroid Sales Division has the right to negotiate licenses under the patent.

This patent covers the treatment of drilling muds which are subject to contamination by or which have been contaminated by anhydrite or gypsum, with certain chemical compounds, viz., barium carbonate, so that the contaminant is eliminated or its effects are overcome, and so that the useful properties of the mud are maintained or restored.

Licenses under this patent are available to oil companies and others engaged in drilling wells, on a royalty basis per pound of compound employed by them in the treatment and use of well drilling fluids in accordance with the patent, and whereby Licensees may freely purchase the compound from any seller thereof. Under the terms of the proposed License Agreements the Licensee has the option of terminating any agreement at any time upon 60 days written notice.

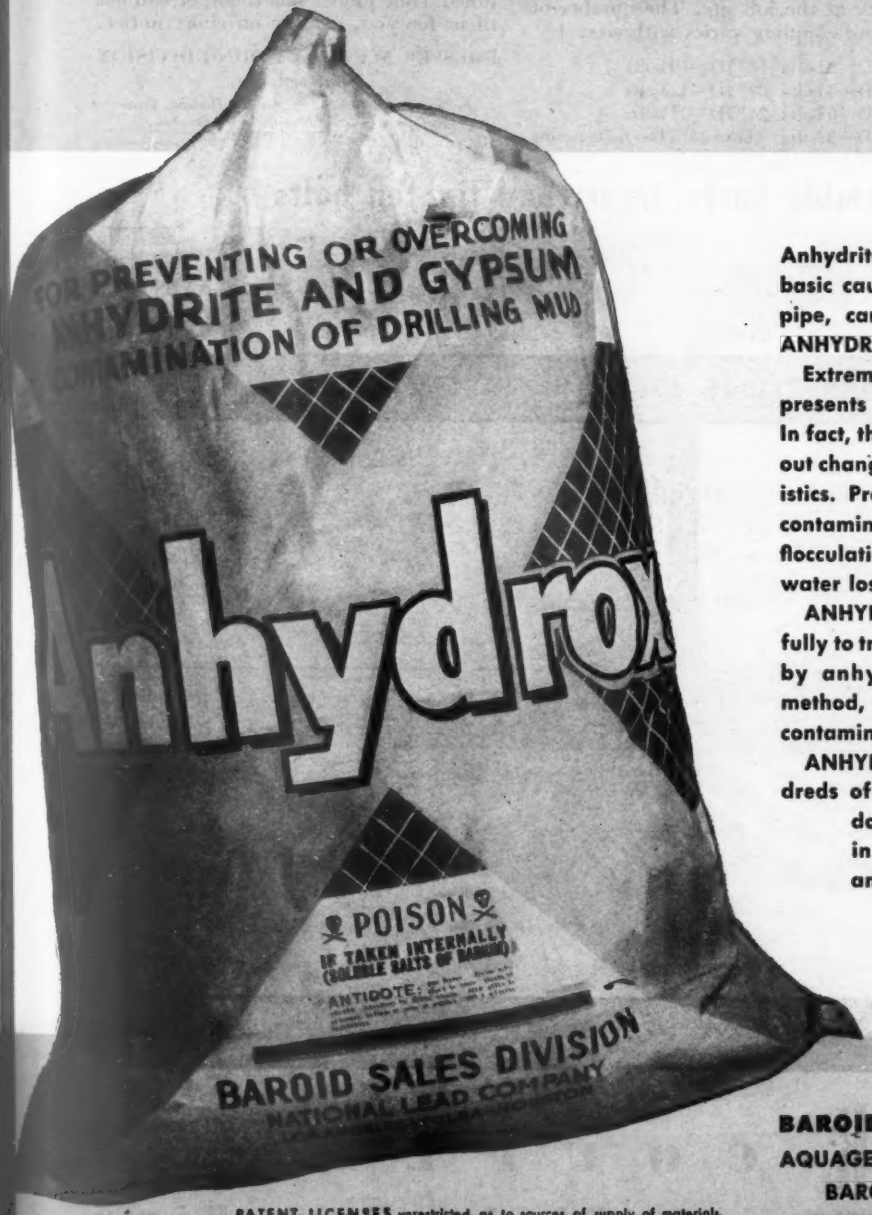
Anhydrox, a trade name for a compound designed for employment under this patent, marketed by Baroid Sales Division, is instrumental in reducing drilling difficulties and in substantial reduction of drilling mud costs in areas where anhydrite or gypsum are encountered. The price at which Anhydrox is sold includes the royalty under the patent.

For complete details of the License, oil companies and others engaged in the drilling of wells are kindly requested to communicate with Baroid Sales Division, National Lead Company at 830 Ducommun Street, Los Angeles 12, Calif.

BAROID

# OLD DRILLING PROBLEM YIELDS TO

# ANHYDROX




**Anhydrite and gypsum contamination, basic cause of many cases of stuck drill pipe, can be overcome by the use of ANHYDROX.**

**Extremely simple to use, ANHYDROX presents no danger from overtreatment. In fact, the mud can be pre-treated without changing the original mud characteristics. Pre-treatment will prevent these contaminating chemicals from causing flocculation or an increase in viscosity, water loss or cake thickness.**

**ANHYDROX also may be used successfully to treat muds already contaminated by anhydrite and gypsum. By either method, the flocculating effects of these contaminants can be quickly overcome.**

**ANHYDROX already has saved hundreds of operators many thousands of dollars and days of drilling time in those areas where anhydrite and gypsum are encountered.**

**BAROID PRODUCTS: ANHYDROX · AQUAGEL · AQUAGEL CEMENT · BAROCO · BAROID · FIBERTEX · IMPERMEX · MICATEX · SMENTOX · STABILITE · ZEOGEL · TESTING EQUIPMENT · BAROID WELL LOGGING SERVICE**

**PATENT LICENSES** unrestricted as to sources of supply of materials, but on royalty bases, will be granted to responsible oil companies and others desiring to practice the subject matter of any and/or all of United States Patents Numbers 1,807,082; 1,991,637; 2,041,086; 2,044,758; 2,064,936; 2,094,316; 2,119,829; 2,214,366; 2,294,877; 2,304,256; 2,387,694; 2,393,165 and further improvements thereof. Applications for Licenses should be made to the Los Angeles office.

# Simple to Install!

## UNSKILLED LABOR CAN ASSEMBLE QUICKLY...THE ONLY TOOL, A WRENCH!

Dresser Couplings consist of a few simple, interchangeable parts, quickly bolted together on plain-end pipe to make a tight, flexible seal. They can be assembled in only the correct way!

Ordinary labor can install "Dressers" at the rate of two man-minutes per bolt. This includes all operations involving handling of the coupling parts after delivery at the job site. The number of bolts per coupling varies with size:

| | | | |
|---|---|---|---|
| 1¼" | ID—2 bolts | 18" | ID—10 bolts |
| 4" | ID—4 bolts | 20" | ID—12 bolts |
| 8" | ID—6 bolts | 24" | ID—14 bolts |
| 12" | ID—8 bolts | Above 24" | ID—bolts to suit |

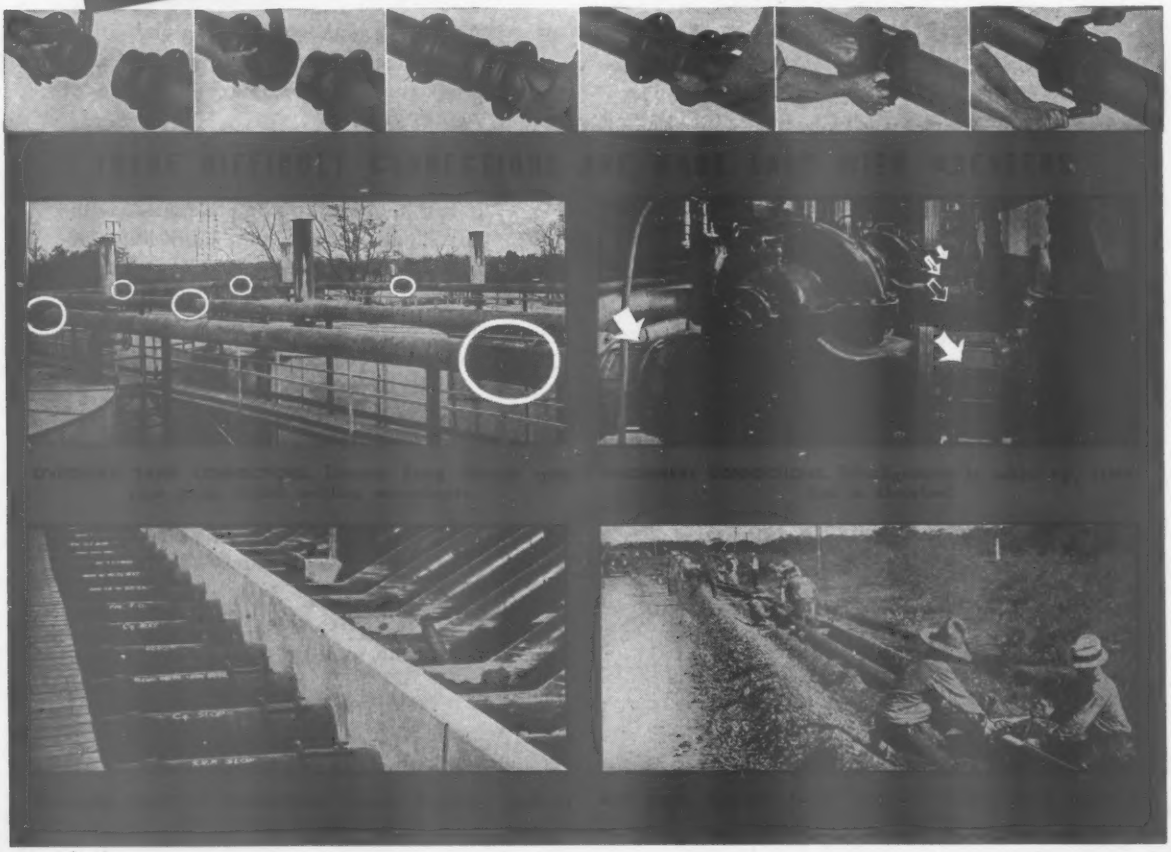
Dresser Couplings stay tight because axial or longitudinal stresses that might normally be destructive, are absorbed by the resilient gasket seal which permits 4 degrees or more deflection (depending on diameter) and ⅜-inch longitudinal movement per coupling.

Specify dependable, easy-to-install Dresser Couplings for your new installations. Your jobber has them, or can get them for you, usually on short notice.

**DRESSER MANUFACTURING DIVISION**
**Bradford, Pa.**

*In Texas: 1121 Rothwell St., Sec. 16, Houston, Texas*
*In Canada: Dresser Manufacturing Co., Ltd., 60 Front St., West, Toronto, Ont.*

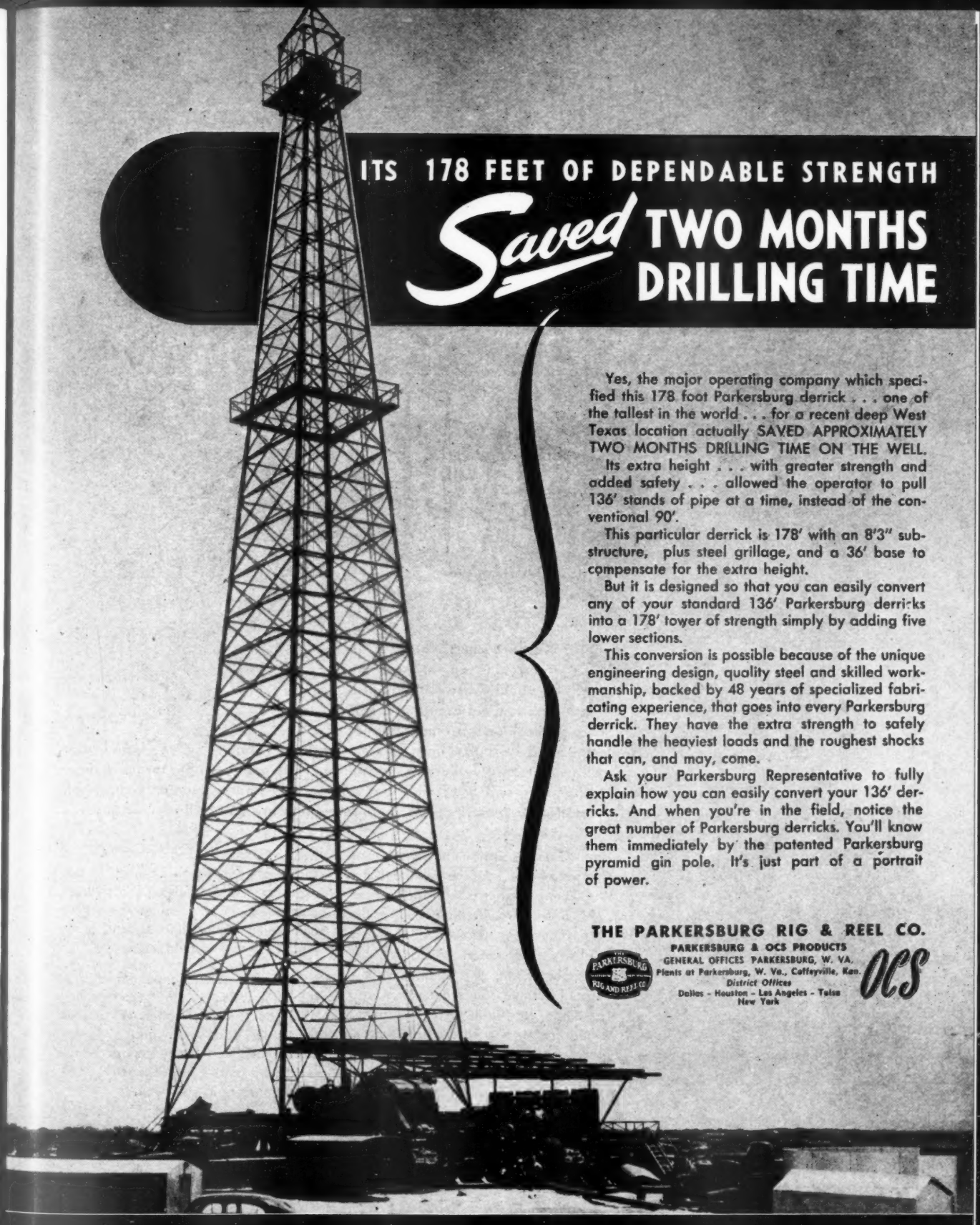
## Assemble parts, insert and tighten bolts



# DRESSER COUPLINGS

**ONE OF THE DRESSER INDUSTRIES**

**for Plain-End Pipe**



ITS 178 FEET OF DEPENDABLE STRENGTH

# *Saved* TWO MONTHS DRILLING TIME

Yes, the major operating company which specified this 178 foot Parkersburg derrick . . . one of the tallest in the world . . . for a recent deep West Texas location actually SAVED APPROXIMATELY TWO MONTHS DRILLING TIME ON THE WELL.

Its extra height . . . with greater strength and added safety . . . allowed the operator to pull 136′ stands of pipe at a time, instead of the conventional 90′.

This particular derrick is 178′ with an 8′3″ substructure, plus steel grillage, and a 36′ base to compensate for the extra height.

But it is designed so that you can easily convert any of your standard 136′ Parkersburg derricks into a 178′ tower of strength simply by adding five lower sections.

This conversion is possible because of the unique engineering design, quality steel and skilled workmanship, backed by 48 years of specialized fabricating experience, that goes into every Parkersburg derrick. They have the extra strength to safely handle the heaviest loads and the roughest shocks that can, and may, come.

Ask your Parkersburg Representative to fully explain how you can easily convert your 136′ derricks. And when you're in the field, notice the great number of Parkersburg derricks. You'll know them immediately by the patented Parkersburg pyramid gin pole. It's just part of a portrait of power.

**THE PARKERSBURG RIG & REEL CO.**

PARKERSBURG & OCS PRODUCTS
GENERAL OFFICES PARKERSBURG, W. VA.
Plants at Parkersburg, W. Va., Coffeyville, Kan.
District Offices
Dallas - Houston - Los Angeles - Tulsa
New York

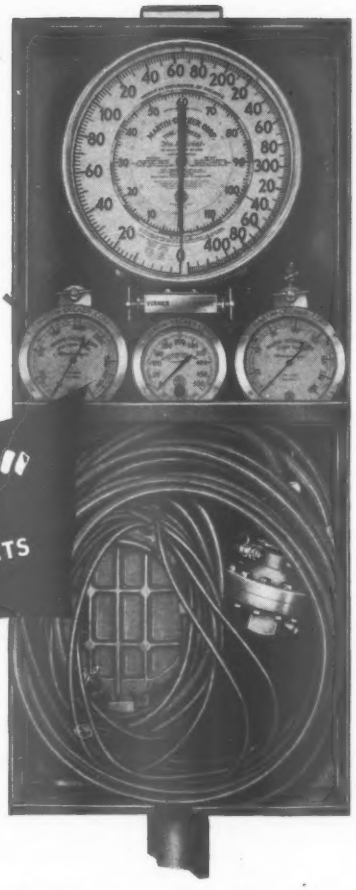
OCS

# PARKERSBURG

It's like having

# FIVE EYES

that can see underground



## The "SEALTITE"

SEES—AND TELLS—ALL THE FACTS ALL THE WAY DOWN

**THE Martin-Decker Sealtite Drilling Control Instrument "sees" *all* the facts about every foot you drill—and reports them accurately. This rugged sensitive instrument has not one—but *five*—control units in one compact steel box . . . a weight indicator with supersensitive vernier mechanism, mud pump gauge, torque gauge, tachometer, and a recorder that continuously and permanently charts *all* variations in weight on bit, mud pump pressure and drill pipe torque.**

There is no job too large . . . no job too small . . . for the Sealtite. It has sufficient capacity to handle even 20,000 foot wells with ease—the big 16" dial face, illuminated for easy night reading, reads directly in thousands of pounds and points. And the special vernier gauge assures precise readings for lightweight operations where extreme accuracy is required. Because the fluid system is factory loaded and sealed, the Sealite is easily installed, easily moved from one location to another. Installation is fast and foolproof—only simple connections are necessary. When moving, diaphragm units remain connected to the instrument, eliminating adjusting and priming. There are no fluid leaks!

• For complete, dependable drilling information . . . the *facts* that enable you to drill a better well in less time at less cost . . . rely on the Martin-Decker Sealtite—the master recording instrument that "sees" exactly what conditions are in your well.

HOME OF THE WEIGHT INDICATOR

## MARTIN DECKER CORP.

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: T. J. CULLEN, BAKERSFIELD, CALIFORNIA
MID CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS

# HOMCO

HOUSTON OIL FIELD MATERIAL COMPANY, Inc.

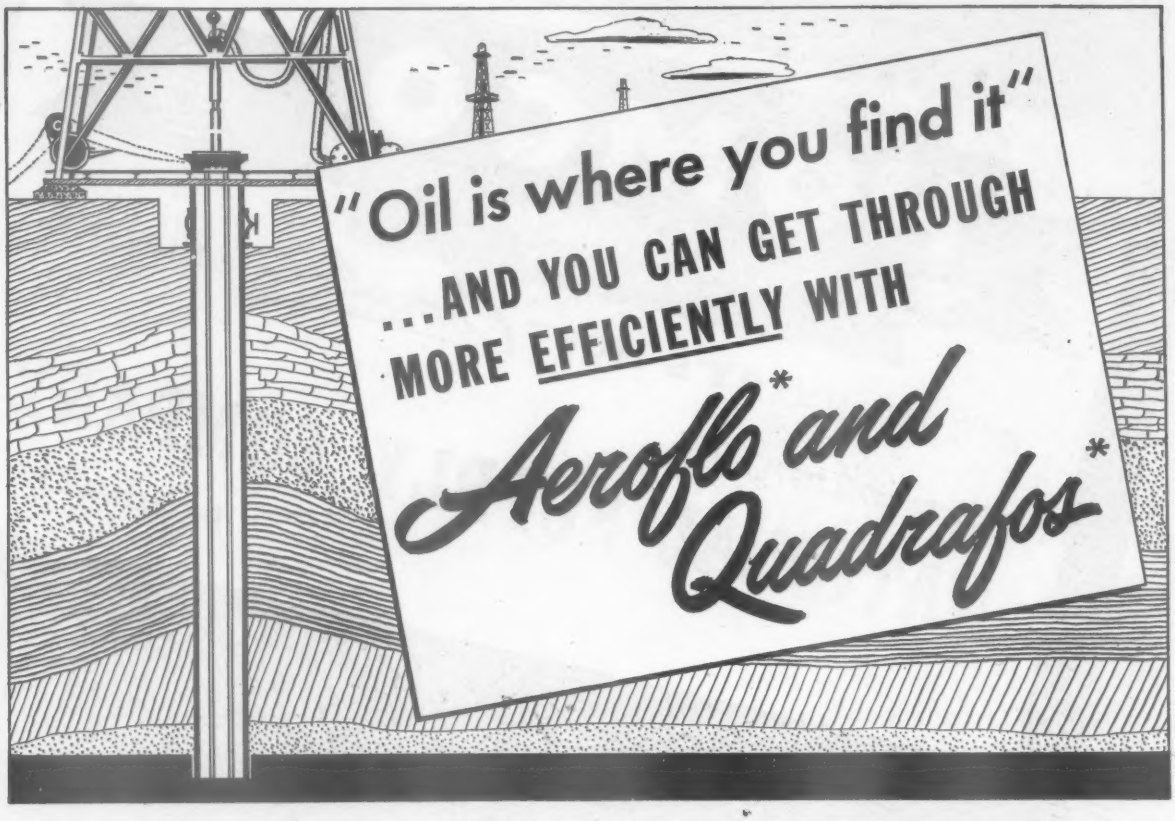
HOUSTON, TEXAS

OIL INDUSTRY'S MOST *Complete* SERVICE

*distributors of*

## NATIONAL SUPPLY COMPANY

*products*




†QUADRAFOS and ‡AEROFLO are available for immediate delivery from stocks kept by many drilling mud chemical distributing houses in all principal oil well drilling centers in the United States.

‡AMERICAN CYANAMID & CHEMICAL CORPORATION
*(Manufacturer and Selling Agent)*

†RUMFORD CHEMICAL WORKS
*(Manufacturer)*

‡AMERICAN CYANAMID & CHEMICAL CORPORATION
*(Selling Agent)*

More efficient drilling means finding oil quicker and at a lower cost. AEROFLO Drilling Mud Conditioning Compound and QUADRAFOS (Sodium Tetraphosphate) can help increase the efficiency of your drilling through better mud control. They provide the solutions to mud conditioning problems in various formations and under a wide range of drilling conditions.

AEROFLO is effective for controlling viscosity in deep wells and under difficult conditions. It increases the effectiveness of phosphates in salt cut muds, in muds that do not respond readily to chemical treatment, and where high temperatures cause rapid thickening.

QUADRAFOS is highly effective where conglomerate, sand and silty shales are drilled and the formation does not provide sufficient colloidal material. It renders inactive such materials as calcium and magnesium compounds, and controls the strength and rate of gel formation caused by dispersion, heat and salt water.

Both AEROFLO and QUADRAFOS reflect the uniformity of modern production control methods. They are available for immediate delivery. For complete information and technical assistance get in touch with American Cyanamid & Chemical Corporation, 229 Shell Bldg., Houston, Texas, or Azusa, California.

*Reg. U. S. Pat. Off.*

"NO FISHING," says General Mud. "Fishing can be fun, but in oil well drilling it is an expensive pastime. AEROFLO and QUADRAFOS will help you get your oil 'catch' with less fishing time."

*When Performance Counts—Call on Cyanamid*

American CYANAMID & Chemical Corporation

(A UNIT OF AMERICAN CYANAMID COMPANY)
30 ROCKEFELLER PLAZA • NEW YORK 20, NEW YORK

# There's a TIMKEN BEARING For every oil field need . . .

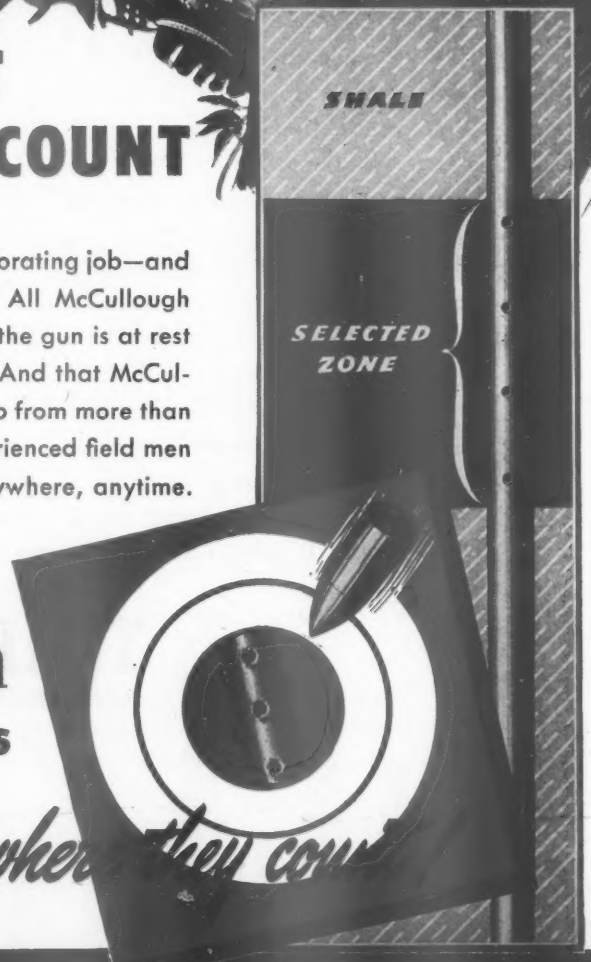
From crown block to derrick floor, wherever mechanical parts must turn — and keep turning — swiftly, smoothly, without much attention for lubrication and maintenance.

In crown blocks, traveling blocks, swivels, rotaries, hoists, drawworks, engines and pumps, Timken Tapered Roller Bearings eliminate friction and wear and at the same time turn aside every challenge of radial, thrust and combined loads and maintain moving parts in correct alignment under every operating condition.

This versatility; this ability to do, with consistent efficiency, everything a bearing should be able to do has made Timken the oil industry's leading bearing—in performance and preference. Make it your choice in the equipment you make or buy; and make sure the trade-mark "TIMKEN" appears on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

**TIMKEN**
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

# The shots that HIT are the shots that COUNT




You need **ALL HITS** for a good perforating job—and McCullough **gives** you **ALL HITS.** All McCullough shots are fired at one time, while the gun is at rest in the **exact** location you specify. And that McCullough gun is selected to fit your job from more than 30 different types and sizes. Experienced field men are ready to give you service anywhere, anytime.

## McCullough

**GUN PERFORATORS**

*Put all the shots where they count*

## 22 SERVICE LOCATIONS

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HOUMA, LA.
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OKLAHOMA CITY, OKLA.
GUYMON, OKLA.
LAUREL, MISSISSIPPI
CASPER, WYO.
LOS ANGELES, CALIF.
VENTURA, CALIF.
BAKERSFIELD, CALIF.
AVENAL, CALIF.
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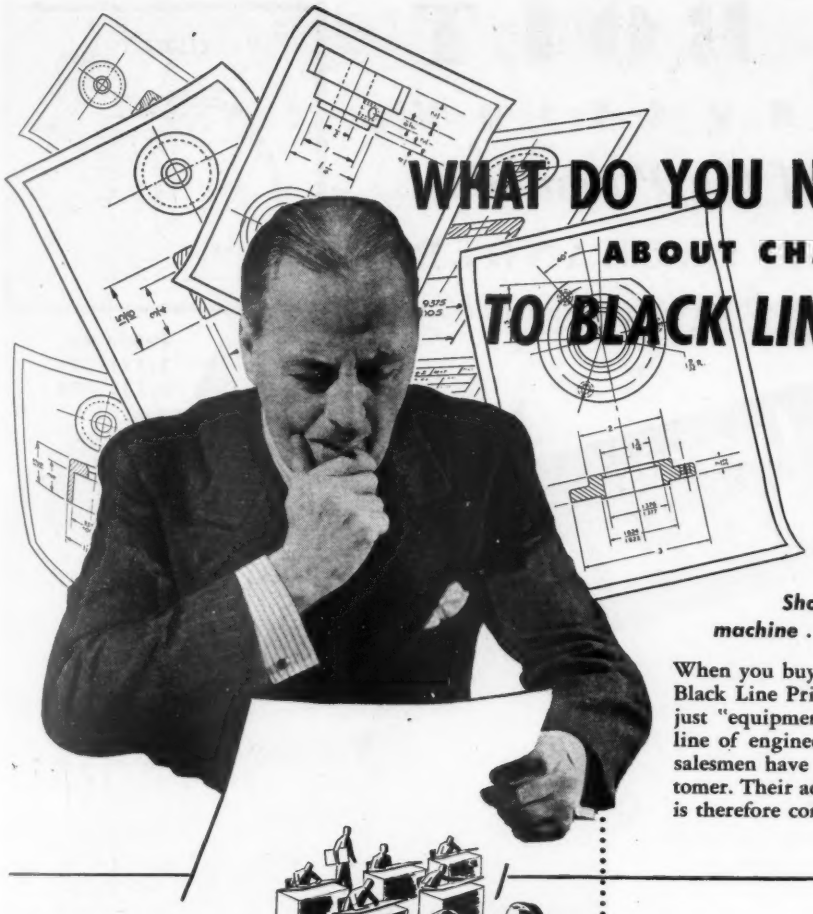

# WHAT DO YOU NEED TO KNOW ABOUT CHANGING TO BLACK LINE PRINTS?

***Should I buy just a machine . . . or a service?***

When you buy a BW machine for making Bruning Black Line Prints, you are buying much more than just "equipment." Because Bruning sells a *complete* line of engineering and drafting supplies, Bruning salesmen have a continuing interest in you as a customer. Their advice on making and using BW Prints is therefore constantly available.

***What's the ratio between draftsmen and print needs?***

Do you know the exact relationship between the number of draftsmen you employ and the volume of black line prints you need? The Bruning BW System provides careful analysis of your print needs—based on 17 years of experience by Bruning field engineers. You are sure of a *careful* preliminary survey.

***How can I provide for peak loads without over-buying on equipment?***

The Bruning BW System provides a line of printing and developing equipment so complete that you are sure of getting the right machine for your needs. This Bruning Model 41 BW Printer-Developer, for example, is especially designed to provide ample volume for medium print users—but costs much less than a high-volume machine.

## You Get These Six Major Advantages With the BRUNING BW SYSTEM

1. A versatile, simple method for making black line prints directly from tracings.
2. 17 years' experience in analyzing printmaking needs.
3. A complete line of materials, including white and green-tinted stock, thin and heavyweight stock, black, red or brown line prints, BW Transparents to supplement original tracings and BW Film for intensifying pencil lines on tracings.
4. A complete line of printing and developing machines to fit every requirement.
5. A continuing service . . . because Bruning sells everything for the engineer and draftsman, not just BW equipment. Buying a BW machine is, therefore, not a "one time sale."
6. Continuing research and development in the customer's interest.

## CHARLES BRUNING COMPANY, INC.

*Since 1897*

NEW YORK — CHICAGO — LOS ANGELES

Atlanta, Boston, Detroit, Houston, Kansas City, Milwaukee, Newark, Pittsburgh, St. Louis, San Francisco, Seattle

CHARLES BRUNING COMPANY, INC.
4732-34 Montrose Avenue, Chicago 41, Illinois

Gentlemen: I want to know more about the Bruning BW System—and why it offers me more for the money. Please send illustrated literature.

*Name*_____

*Company*_____

*Street*_____

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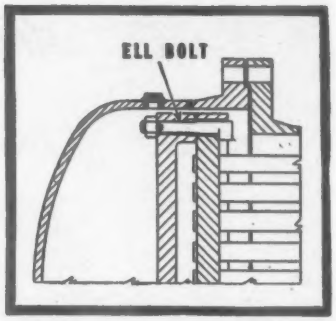
# ELL BOLT
## CONSTRUCTION
### *a feature of the Patented*
## VOGT HEAT EXCHANGER
### *Floating Tube Sheet Assembly*




**Patent Nos.**
**1,895,735**
**2,232,478**

*Assures*
**NO LEAKS HERE**

**YOU LOSE** when an exchanger leaks . . . . with the possibility of fluid contamination, or shut down for repairs.

None of these evils need plague you when you employ the Vogt patented floating tube sheet assembly because there is no distortion of a split ring to worry about in making up the joint time after time. Its easy to make tight and it stays tight!

Critical materials are saved too because the design makes possible a smaller diameter of shell through reduction of the dead space between the shell and the tube bundle.

Our new bulletin HE-5 is a pictorial presentation of standard and special types of Vogt Heat Exchangers. Write for a copy on your letter head.

**HENRY VOGT MACHINE COMPANY**
Incorporated
**LOUISVILLE 10, KENTUCKY**
Branch Offices: New York, Philadelphia, Cleveland, Chicago, Dallas.

**Vogt** *Heat Transfer* **EQUIPMENT**

SAYS THE MAN IN THE HELMET—
"My first choice for any welding job is one of these swell
AIRCO ELECTRODES.
They're easy to use and they do a grand job."

THAT in brief is the reason why so many welders prefer Airco Electrodes for every welding job. For, in addition to meeting the metallurgical and mechanical requirements of each specific job, Airco Electrodes have those easy-working features that enable the welding operator to meet output schedules consistently.

After exacting laboratory trials each new Airco electrode is thoroughly pretested for working ease and efficiency by welding operators of varying skill and experience. Their suggestions, incorporated into the final product, assure an electrode that will rate high with the vast majority of operators.

* * *

## *SEND FOR FREE CATALOG*

—which gives detailed information on Airco's complete line of shielded arc electrodes for every welding job. Address your local Airco office or Dept. OG, Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

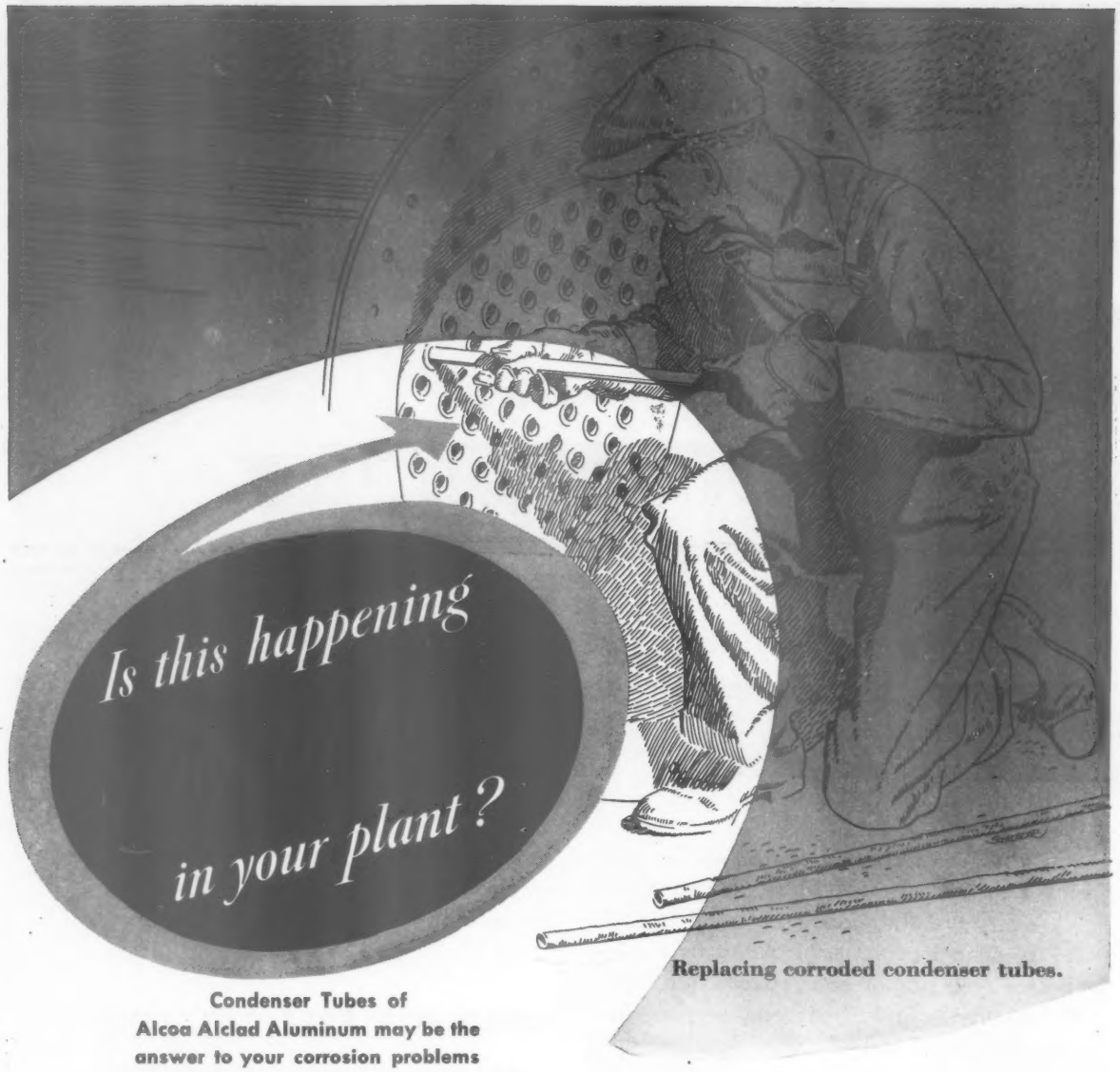
**AIR REDUCTION** (AIRCO)

**OFFICES IN PRINCIPAL CITIES**

Represented Internationally by Airco Export Corporation

*Weld with*

AIRCO **ELECTRODES** FOR BETTER WELDS AND EASIER WELDING




Replacing corroded condenser tubes.

**Condenser Tubes of Alcoa Alclad Aluminum may be the answer to your corrosion problems**

The idea's not new. Condenser tubes of Alcoa Aluminum are already employed in all manner of processing plants. The aluminum safeguards product quality. And it offers high resistance to the attack of corrosive cooling waters and of materials being processed.

Now, a new development in tubing is offered —Alcoa Alclad—strong aluminum combined with a highly protective interior coating of aluminum. An even greater number of gases and liquids can be handled by aluminum condenser tubes than before.

Why not try aluminum tubes in one of your condensers? In addition to being long-lived, tubes of Alcoa Alclad are surprisingly low in first cost. See our nearest sales office or write ALUMINUM COMPANY OF AMERICA, 1928 Gulf Building, Pittsburgh 19, Penna.

**ALCOA ALUMINUM**

ALCOA ALUMINUM

# SYMBOL FOR TOUGHNESS

## PACIFIC MOLOY LINERS

The symbol for toughness in Deepwell Pumps is "Moloy"—developed, named, and processed by Pacific. "Moloy" didn't just happen—like other outstanding contributions in the field of industrial science, "Moloy"—an alloy unbelievably resistant to sand, high pressure, abrasion, corrosion, and temperature—is the result of intensive metallurgical research, combined with the sure knowledge resulting from years of actual field experience. Liners of Pacific "Moloy" are honed to a high mirror finish, and are held to the closest tolerances. That is why Pacific Deep Well Pumps give long, trouble-free service. And remember, only from Pacific can you reap the positive benefits assured by "Moloy" liners. Be *Specific—Buy Pacific.*

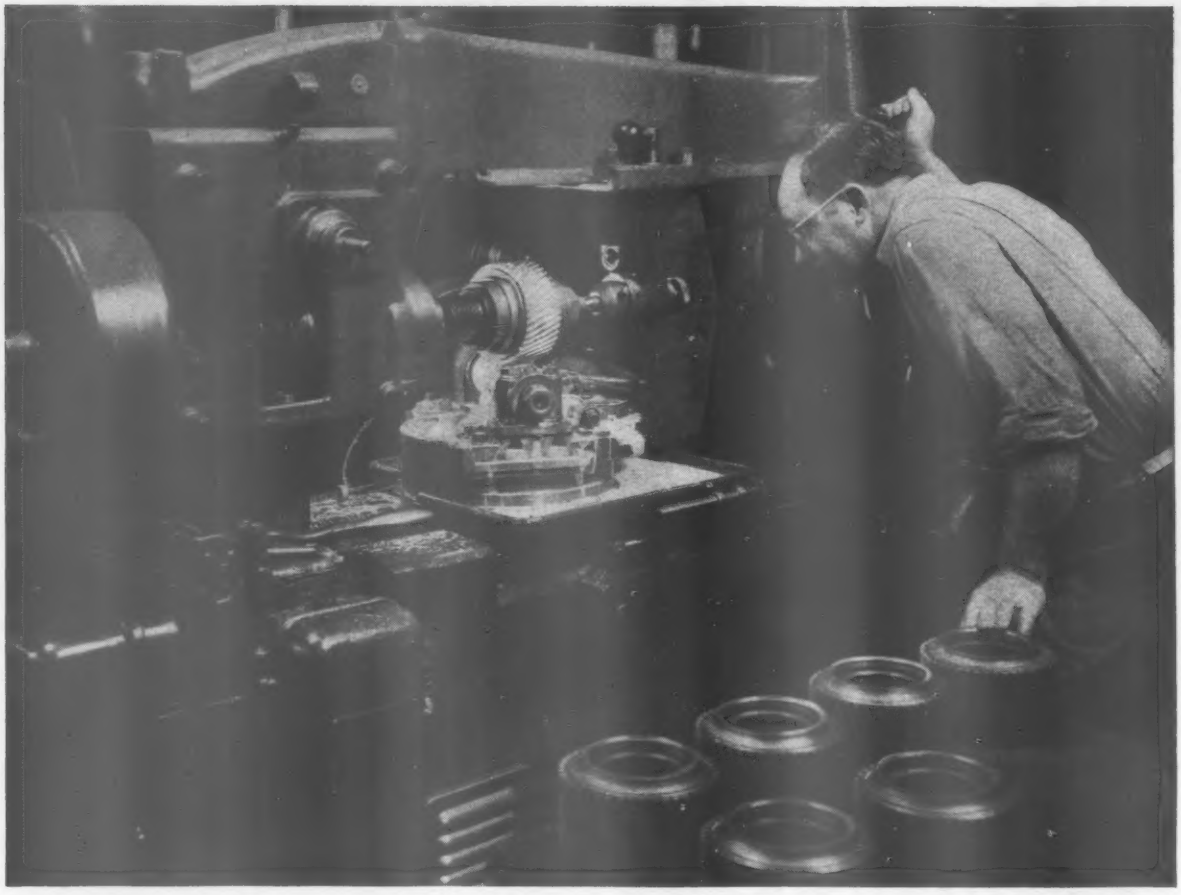
**PACIFIC PUMPS, INC.,** *Huntington Park, Calif.*

*One of the Dresser Industries*

Export: Channin Bldg., 122 E. 42nd St., N. Y.

33-P

# PACIFIC *Engineered* PUMPS



*Cutting teeth for a helical gear in one of the precision hobbing machines.*

# We cut our teeth!

To bring you the finest in crawler tractors . . . to assure efficient, economical operation, all gears and spline shafts for Oliver "Cletrac" tractors are cut in our own plant. In this way, we can guarantee the close tolerances . . . the precision fits so necessary for smooth, quiet operation and freedom from excessive maintenance.

Cutting our own gears is but one extra step we take to assure the *extra* quality that is inherent in every Oliver "Cletrac" tractor part. Materials, workmanship and equipment are all based on one standard . . . the built-in quality that means added years of service.

Maintenance of that standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

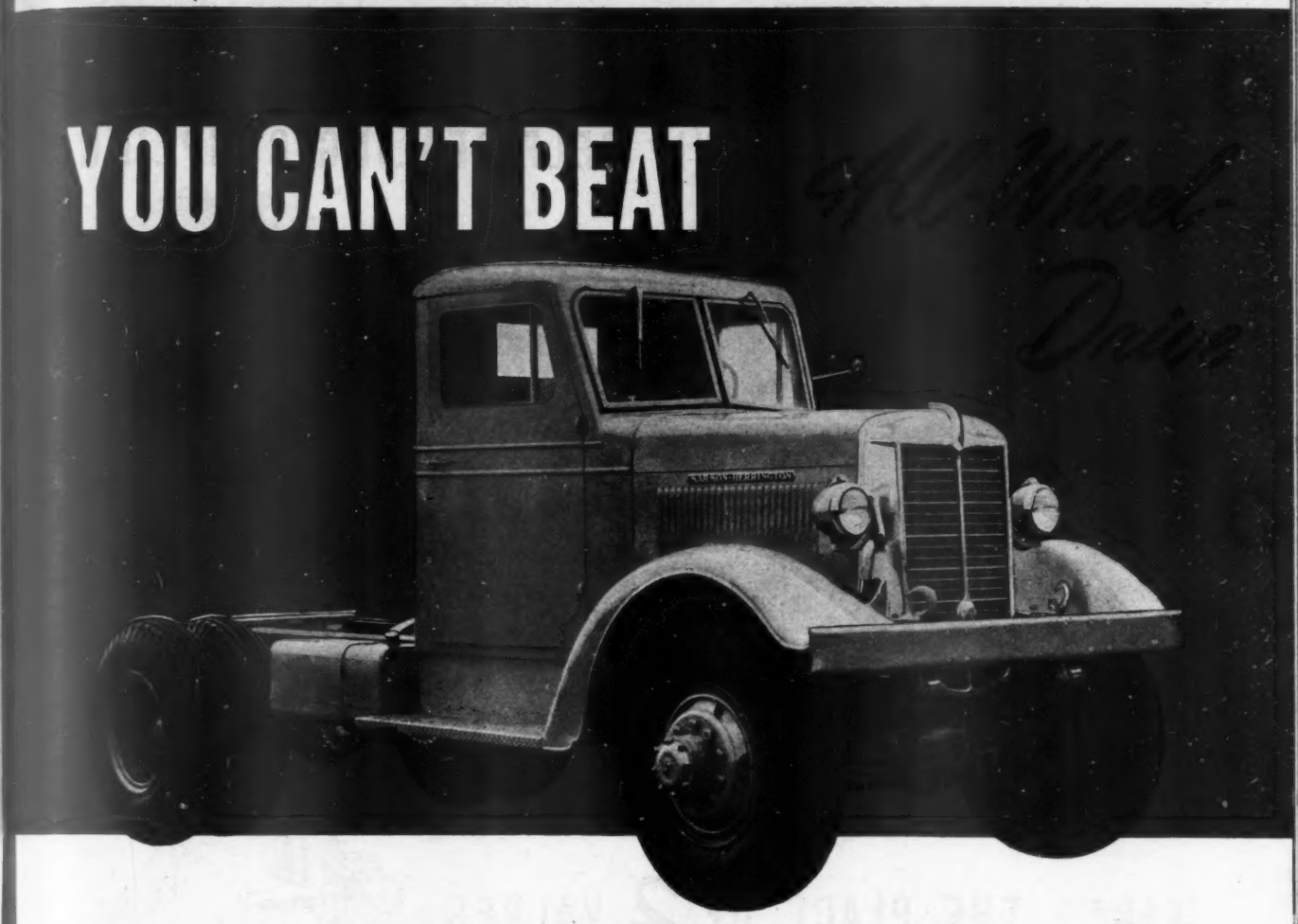
**CLETRAC**

OLIVER CORPORATION Cletrac

*a product of*

**The OLIVER Corporation**

# YOU CAN'T BEAT



## FOR TRANSPORTATION'S TOUGHEST JOBS

Marmon-Herrington *All-Wheel-Drive* Trucks enter the picture where other trucks fade out. With live power and traction applied to *all wheels,* they are specifically designed to move maximum pay loads over and through places that leave conventional-drive trucks gasping in their tracks.

For 1946, Marmon-Herrington offers two new, importantly improved Heavy-Duty *All-Wheel-Drive* Trucks. More rugged, more powerful, more efficient than ever before, these new models have "everything it takes" to buck and conquer the worst that nature has to offer—deepest mud, sand and snow, steepest hills and mountain trails.

Important features in the 1946 models include: 4- or 6-wheel drive—greater approach angle—low center of gravity—wide range of gear ratios—safe, easy-action steering—powerful, positive-grip air brakes—rated gross capacities up to 37,000 pounds —and many other advantages.

Discover how these great new Heavy-Duty *All-Wheel-Drive* Trucks, or Marmon-Herrington *All-Wheel-Drive* converted Fords, can solve your toughest transportation problems. See your near-by Marmon-Herrington distributor, or write company direct.

MARMON-HERRINGTON COMPANY, INC. • INDIANAPOLIS 7, INDIANA

**Road Building and Maintenance**
Great power and traction for moving heavy loads through mud, dirt, sand, gravel. Available with underbody blades for grading, etc.

**Snow Removal**
Sure-footed *All-Wheel-Drive* tractive power assures fast, efficient removal of heaviest snow. Adapted to either blade or rotary plows.

**Oil Field Service**
Unexcelled for transporting oil machinery and equipment, including derricks and pipe, to and from locations—regardless of terrain.

**Public Utility Service**
Ideal for both on- and off-the-road operations. Available with winches, derricks, earth borers, etc., for every type of public utility construction and maintenance work.

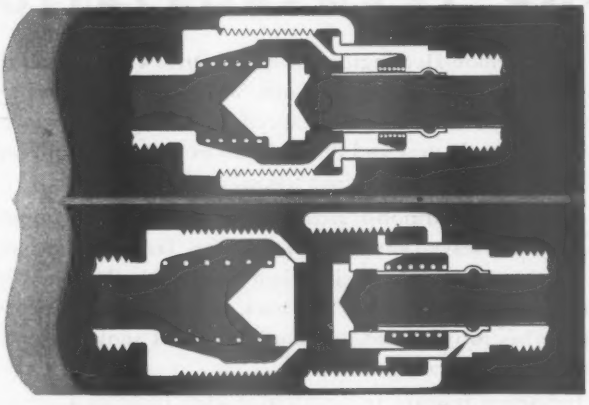
**Logging, Mining, etc.**
Rugged strength and *All-Wheel-Drive* power combine to handle the back-breaking loads these operations demand, both on the road and off.

**MARMON-HERRINGTON** *All-Wheel-Drive Trucks*

# ONE AEROQUIP SELF-SEALING COUPLING*

## TAKES THE PLACE OF 2 VALVES

1. Separation and reconnection of fluid carrying lines without loss of liquid or inclusion of air.
2. Simplicity of design by eliminating two manually operated valves together with necessary fittings and connections.
3. Quick acting nut permits disconnection or reconnection in less than a second.
4. Reduces service problems by permitting quick removal and replacement of machine components.
5. Less restriction to flow.



For lines carrying refrigerants, oil, fuels, coolants, hydraulic fluids, and other liquids and gases.

## AEROQUIP CORPORATION

JACKSON, MICHIGAN

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AEROQUIP FIRSTS
Detachable Hose Fittings
Hydrofuse
X-Washers
* Another Aeroquip First

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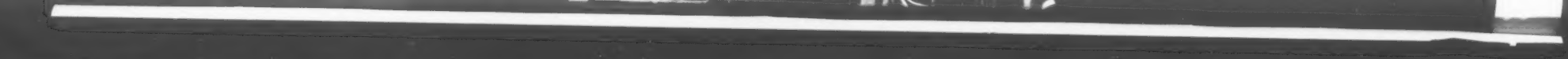
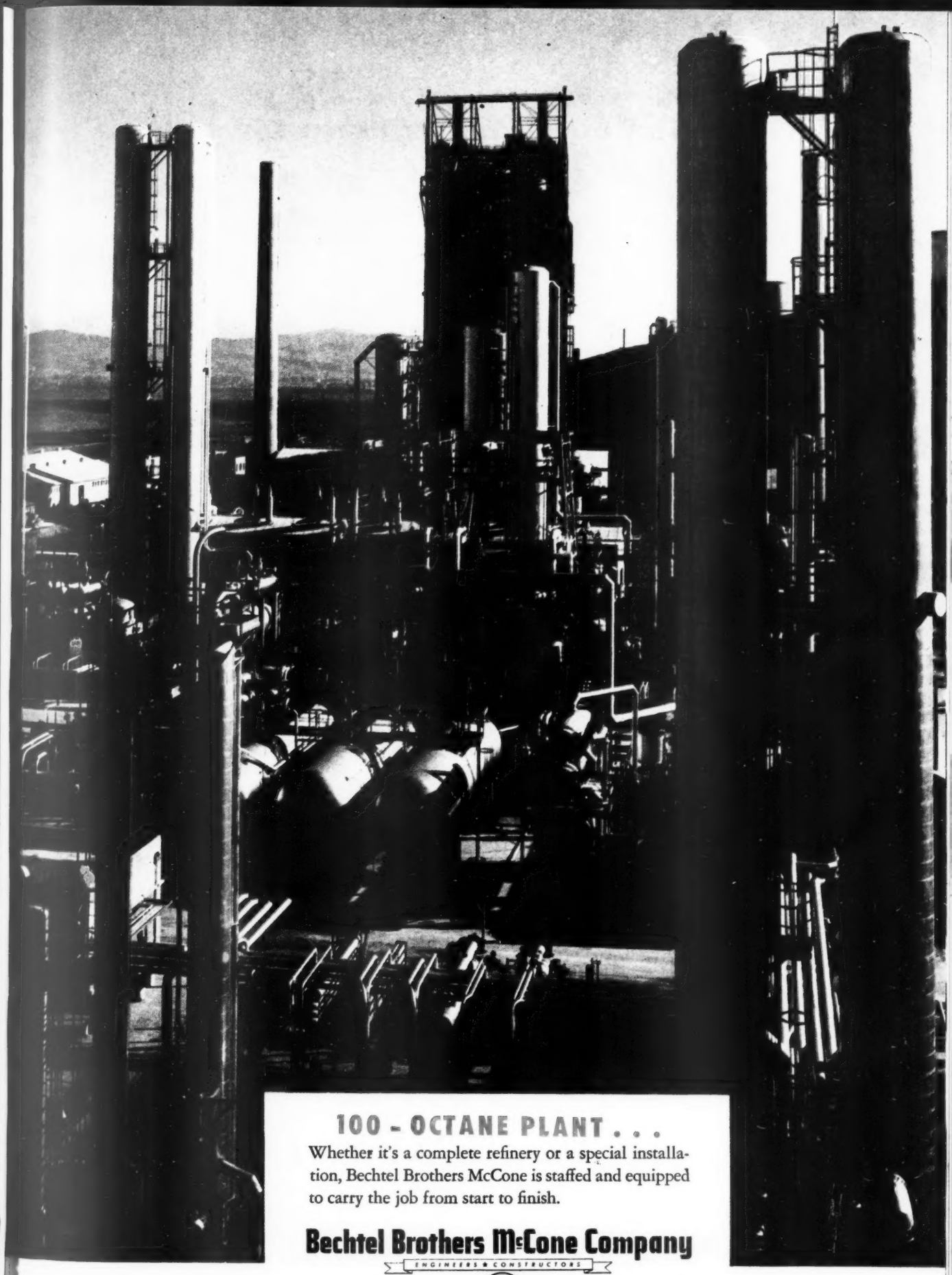




## 100 - OCTANE PLANT . . .

Whether it's a complete refinery or a special installation, Bechtel Brothers McCone is staffed and equipped to carry the job from start to finish.

**Bechtel Brothers McCone Company**

ENGINEERS & CONSTRUCTORS

San Francisco BBM Los Angeles

# as drilling goes farther down the hole...

The 25 to 35 thousand wells which the oil industry intends to drill each year are averaging far greater depths than prewar wells. And depth greatly increases cost. As the lush days of drilling wane, each well has to be squeezed to the last drop.

So Dresser Industries, being in fact a part of the oil industry, goes after the cost of oil, too, even to such detail as the cost of mud. Mud strikes most people as an utterly cost-free material. But mud is pumped into wells to cool the drilling bit and carry the rock chips up to the surface. By the time mud has been pumped a mile down and a mile back again, it takes on cost. Three member companies of Dresser Industries recently put their heads together and, by the teamwork that is the spirit of Dresser Industries, brought out a new Triplex mud pump that is far better than any earlier pump and helps cut the cost of oilwell drilling.

All along the line—from better drawworks for drilling, or pumps, either mechanical or hydraulic whichever the job calls for, right on into refinery equipment—Dresser Industries, Inc., is constantly engineering to reduce costs in the oil industry. If it's made by one of the Dresser Industries, it's—*First to be new—Last to wear out.*

BRYANT Heater Company, Cleveland, Ohio

DRESSER Manufacturing Div., Bradford, Pa.

DAY & NIGHT Mfg. Co., Monrovia, Calif.

PACIFIC Pumps, Inc., Huntington Park, Calif.

INTERNATIONAL Derrick & Equipment Co., Columbus, Marietta & Delaware, Ohio; Beaumont, Texas; Torrance, Calif.

PAYNE Furnace Co., Beverly Hills, Calif.

CLARK Bros. Co., Inc., Olean, New York

ROOTS-CONNERSVILLE Blower Corporation, Connersville, Ind.

DRESSER Manufacturing Company, Limited Toronto, Ont., Canada

KOBE, Inc., Huntington Park, Calif.

STACEY BROS. Gas Construction Company Cincinnati, Ohio

SECURITY Engineering Co., Inc., Whittier, Calif.

VAN DER HORST Corporation of America, Olean, N. Y. and Cleveland, Ohio

*Creative Engineering*
IN OIL PRODUCTION

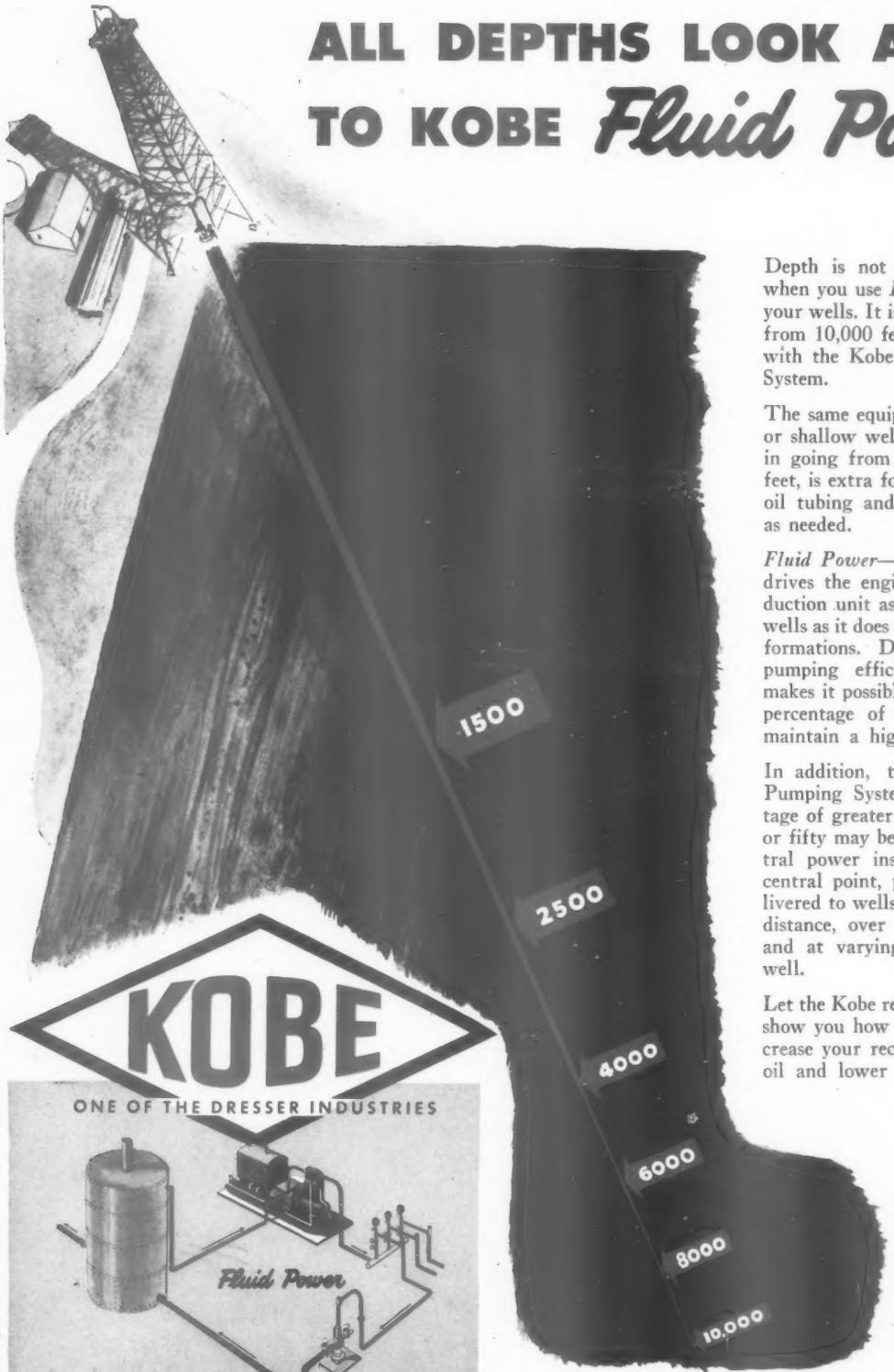
**DRESSER INDUSTRIES, INC.**

TERMINAL TOWER · CLEVELAND 13, OHIO

Geared to anticipate the course of industry
Oil and gas equipment a specialty

PACIFIC
SUPER STEEL
WIRE ROPE
FACTORY AND GENERAL OFFICES
LOS ANGELES, CALIF. BRANCHES:
SAN FRANCISCO HOUSTON PORTLAND

# ALL DEPTHS LOOK ALIKE TO KOBE *Fluid Power*




Depth is not a controlling factor when you use *Fluid Power* to pump your wells. It is as practical to pump from 10,000 feet as it is from 1500 with the Kobe Hydraulic Pumping System.

The same equipment is used in deep or shallow wells. All that is added, in going from 1500 feet to 10,000 feet, is extra footage of small power oil tubing and surface horsepower, as needed.

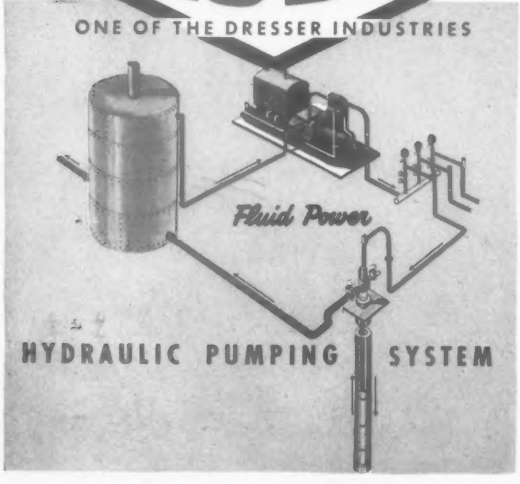
*Fluid Power*—oil under pressure—drives the engine of the Kobe production unit as easily in the deepest wells as it does those in the shallower formations. Due to its increased pumping efficiency, *Fluid Power* makes it possible to recover a higher percentage of produceable oil and maintain a higher daily output.

In addition, the Kobe Hydraulic Pumping System offers the advantage of greater flexibility. One well or fifty may be pumped from a central power installation. From this central point, power oil can be delivered to wells of any depth, at any distance, over any type of terrain, and at varying pressures for each well.

Let the Kobe representative near you show you how *Fluid Power* can increase your recovery of produceable oil and lower your pumping costs.

**KOBE**

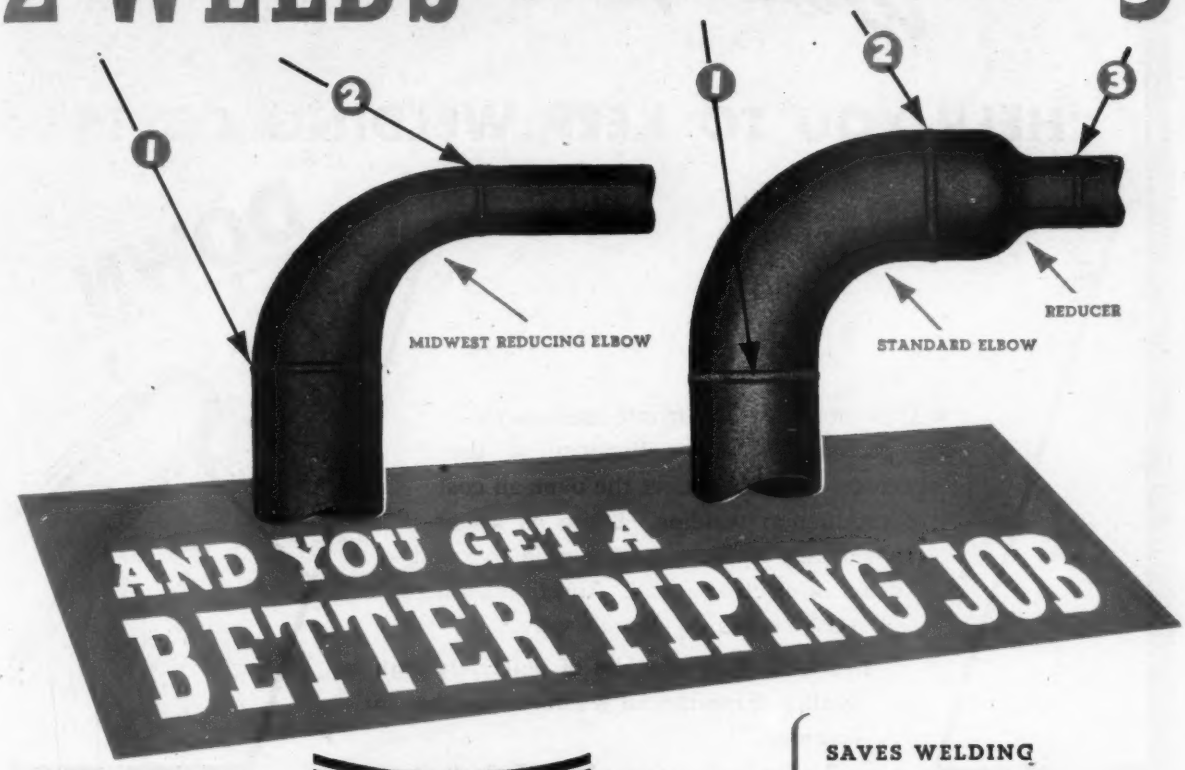
ONE OF THE DRESSER INDUSTRIES




Kobe, Inc.—*General Offices,* Huntington Park, Calif.; *Division* and *District Offices:* Huntington Park and Bakersfield, Calif.; Oklahoma City and Tulsa, Okla.; Brownfield, Dallas, Houston, Longview, Odessa and Wichita Falls, Texas; Great Bend, Kansas; New York, N.Y.

**PUMP THE MODERN WAY—USE KOBE**

# 2 WELDS INSTEAD OF 3




## AND YOU GET A BETTER PIPING JOB

MIDWEST

## REDUCING WELDING ELBOW

- SAVES WELDING
- SAVES MONEY
- SAVES TIME
- REDUCES TURBULENCE
- IMPROVES APPEARANCE

One weld is eliminated when the Midwest Reducing Elbow is used to change both direction and pipe size in a welded pipe line . . . you make only two welds instead of three. This exclusive Midwest Fitting takes the place of both a standard elbow and a reducer, as shown above. This saves time and money, produces a smoother, cleaner, better appearing job. In addition, the gradual reduction, smooth curve and absence of abrupt neck reduce turbulence. Insulation is also easier.

All the advantages of Midwest Standard Elbows are to be found in Midwest Reducing Elbows . . . unusual dimensional accuracy, beneficial effect of working metal in compression, stress relieving, etc. Center-to-end dimensions are the same as for standard elbows with which they are interchangeable.

This reducing elbow is one of many Midwest Welding Fittings designed to reduce the cost and improve the quality of welded piping. Write for Bulletin WF-41 for complete information.

MIDWEST

**PIPING & SUPPLY COMPANY, Inc.**

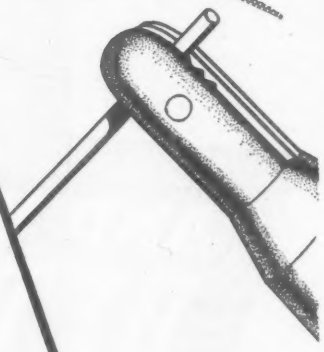
Main Office: 1450 South Second St., St. Louis 4, Mo. • Sales Offices: New York 7—30 Church St. • Chicago 3—645 Marquette Bldg. • Los Angeles 33—520 Anderson St. • Houston 2—229 Shell Bldg. • Tulsa 3—533 Mayo Bldg. • Atlanta 3 — Red Rock Bldg. • South Boston 27—426 First St. • Distributors in Many Cities.

MIDWEST WELDING FITTINGS IMPROVE DESIGN AND REDUCE PIPING COSTS

# PAGE *Welding* ELECTRODES

## HELP YOU TO KEEP WELDING COSTS

**DOWN**



• Type and cost of current used—welding position—fit-up—efficiency of the operator—all these affect the over-all cost of production welding. Quite as important as any of these are the type, size and make of electrode used. And that's where PAGE comes in. Here's why.

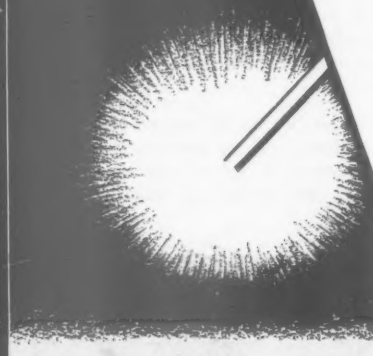
**1 • PAGE electrodes are of uniformly high quality. Experienced welders take that for granted.**

**2 • The wide range of PAGE electrodes and gas welding rods includes the one most economical rod for practically every type of production welding.**

**3 • Through long and close contact with welding engineers and welders, PAGE is often able to help on problems of welding technique and the selection of rods.**

PAGE specializes in stainless steel. But whatever your problem, if it has to do with welding, it will pay you to . . .

*Get in touch with Page!*



ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

ACCO TRADE MARK

More and more oil field equipment manufacturers are specifying castings bearing this tag . . . it's their assurance of a Sound Steel Casting.

"SOUND STEEL CASTINGS"

WEBSTER SAYS: "Solid in structure; also firm in texture; stable. Free from flaw or defect; undamaged or unimpaired."

# EAST TEXAS
## ELECTRIC STEEL CO., LTD.
Fort Worth · Longview · Houston
(Plant)

# Why DESIGN ENGINEERS SPECIFY TWIN DISC CLUTCHES

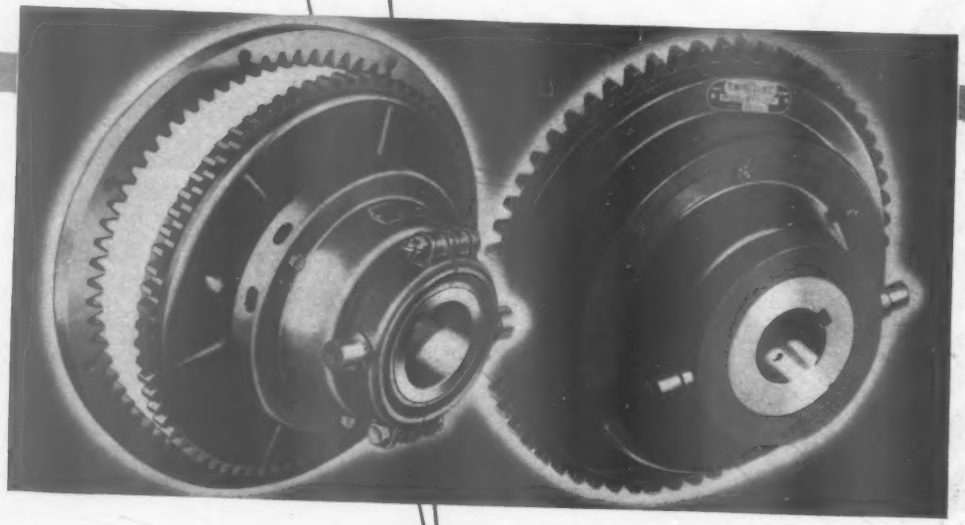
Ask a design engineer why he specifies Twin Disc Clutches and his answer will probably be: "Because they are *mechanically adaptable*."

This means that in the diversified line of standard Twin Disc Clutches the engineer usually finds one which fits into his design with built-to-order exactness.

The Model CL and the Model E clutches illustrated are good examples . . . you'll find these clutches standard equipment in most of the nationally known rigs. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Ill.).

*Twin Disc Model CL Clutches (at left) are designed for application where a smaller size than the Model E is required. The Model CL has built-in features similar to the Model E. Sizes: 5½" 11½" in one, two or three-plate construction.*

*Twin Disc Model E Friction Clutches (at right) are fully enclosed to protect working parts against destructive dust and dirt. Sizes: 14" to 42" in single or two-plate assemblies.*



SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

Every OTIS sub-surface tool delivered to the user incorporates the latest field-tested improvements. OTIS never "unloads" obsolete equipment. Flexible production methods make possible the quick adaptation of design changes. Accuracy in fabrication of the component parts assures their positive interchangeability.

OTIS engineers are recognized for their ability to meet successfully the ever-increasing oil field pressure problems... problems in which obsolescence has no part. Whether a minor change in the I. D. of a port, or a major change in the type of raw material — the tool you receive from OTIS embodies *all* recent engineering developments.

The continued perfection of all OTIS sub-surface tools and services is made possible only through the close cooperation and willing assistance of the industry's engineers and field men. For this all-important aid to our success, OTIS offers sincerest thanks.

OTIS PRESSURE CONTROL EQUIPMENT

**OTIS PRESSURE CONTROL, INC.**

SALES AND SERVICE . . . DALLAS 9, TEXAS

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MANUFACTURE AND DEVELOPMENT
OTIS ENGINEERING CORPORATION
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OTIS EASTERN SERVICE, INC. Bradford, Pennsylvania
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# A complete line of Socket Welding Fittings...

+

## Easy Assembly

FORGED STEEL SOCKET WELDING FITTINGS
FOR DOUBLE EXTRA HEAVY PIPE

FORGED STEEL SOCKET WELDING FITTINGS
FOR SCHEDULE 160 SEAMLESS TUBING

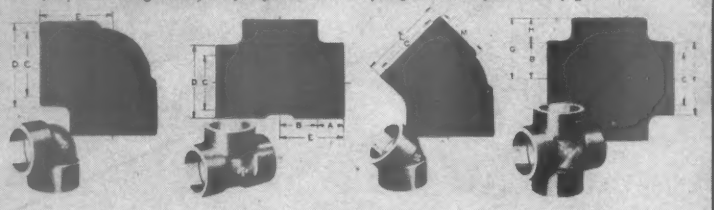
FORGED STEEL SOCKET WELDING FITTINGS
FOR EXTRA HEAVY PIPE—SCHEDULE 80

FORGED STEEL SOCKET WELDING FITTINGS
FOR STANDARD PIPE—SCHEDULE 40

*Pressure Ratings—Carbon Steel Fittings*

2000 Lbs. Cold non-shock working pressure—Air, Oil, Water or Gas.
700 Lbs. Non-shock working pressure at 900° F.—Steam, Hot Oil or Vapor.

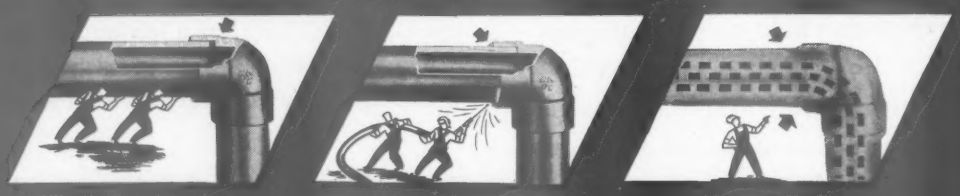
*(For pressure ratings on alloy steel fittings and carbon steel fittings at other temperatures see pages 31 to 32)*



90° ELBOW No. 470 · TEE No. 570 · 45° ELBOW No. 670 · CROSS No. 870

DIMENSIONS IN INCHES

| SIZE, INCHES | ⅛ | ¼ | ⅜ | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3/8 | 7/16 | 1/2 | 5/8 | 11/16 | 13/16 | 15/16 | 1 1/16 | 1 1/8 | 1 5/16 | 1 7/16 | 1 11/16 |
| B | 7/16 | 1/2 | 9/16 | 11/16 | 13/16 | 15/16 | 1 1/16 | 1 3/16 | 1 5/16 | 1 7/16 | 2 1/16 | 2 5/16 |
| C | .42 | .550 | .690 | .855 | 1.065 | 1.330 | 1.675 | 1.915 | 2.406 | 2.906 | 3.535 | 4.545 |



WATSON-STILLMAN Socket Welding Fittings give you many sales advantages. Among the outstanding are: (a) Available for use with all weights of pipe and tubing. (b) Conform to ASA Standards. (c) Simplify and speed up installation. (d) Permanently tight leak-proof joints, reduces maintenance costs. (e) Available in carbon steel, carbon-moly and stainless steel. Sizes ⅛" through 4" N.P.S.
Watson-Stillman Co., Roselle, New Jersey

WATSON-STILLMAN
DISTRIBUTOR PRODUCTS DIVISION

Sold Through Leading Distributors

Seismic has helped numerous operators find the right answer to this soliloquy. Experience gained from more than a decade of operations, covering hundreds of seismograph surveys, enables our seismologists to correctly interpret field records . . . to condemn or approve acreage with a high degree of accuracy.

**SEISMIC EXPLORATIONS, INCORPORATED**
**Gulf Building — Houston**

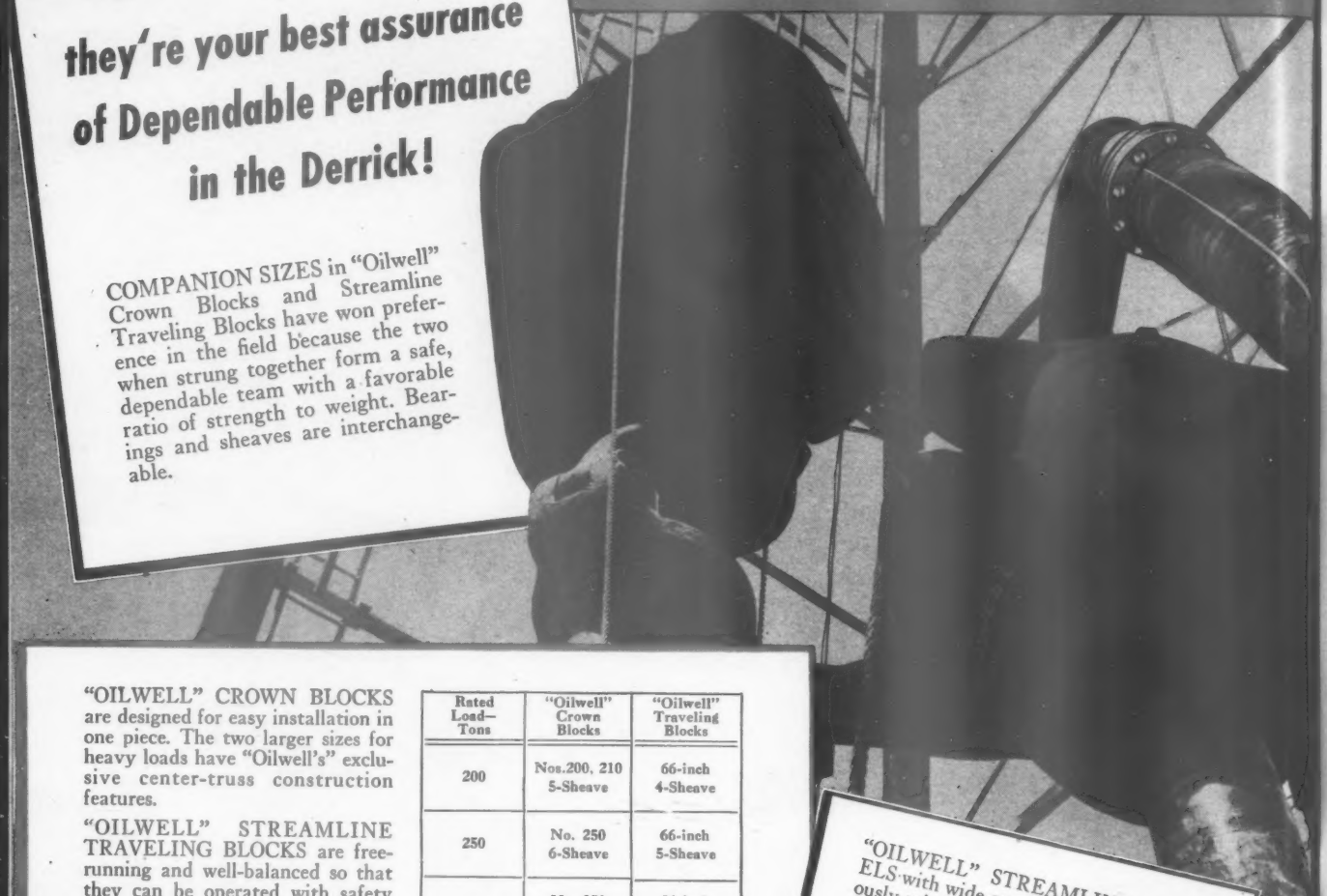
# SEISMIC

## SUBSURFACE SURVEYS

*Accurately Interpreted*

# Select "Oilwell"

## CROWN BLOCKS
## TRAVELING BLOCKS
## AND SWIVELS



## they're your best assurance of Dependable Performance in the Derrick!

COMPANION SIZES in "Oilwell" Crown Blocks and Streamline Traveling Blocks have won preference in the field because the two when strung together form a safe, dependable team with a favorable ratio of strength to weight. Bearings and sheaves are interchangeable.

"OILWELL" CROWN BLOCKS are designed for easy installation in one piece. The two larger sizes for heavy loads have "Oilwell's" exclusive center-truss construction features.

"OILWELL" STREAMLINE TRAVELING BLOCKS are free-running and well-balanced so that they can be operated with safety just as rapidly as crews can handle the pipe.

| Rated Load—Tons | "Oilwell" Crown Blocks | "Oilwell" Traveling Blocks |
|---|---|---|
| 200 | Nos. 200, 210 5-Sheave | 66-inch 4-Sheave |
| 250 | No. 250 6-Sheave | 66-inch 5-Sheave |
| 350 | No. 350 6-Sheave | 80-inch 5-Sheave |

"OILWELL" STREAMLINE SWIVELS with wide-spaced bearings continuously submerged in a circulating oilbath, embody numerous advanced design features which have enabled them to give outstanding service on many of the world's deepest wells. Other features which contribute to trouble-free performance include DI-HARD wash pipe with self-sealing packing which requires no adjustment and long-radius, heat-treated, cast-steel gooseneck with enlarged flow passage at the bend which reduces flow-restriction.

| Swivel Rating Recommendation with 4½" Drill Pipe at 100 R.P.M.—Feet | "Oilwell" Swivel Number |
|---|---|
| 5,700 | No. 60-C |
| 8,500 | No. 100-C |
| 12,500 | No. 150-C |
| 17,000 | No. 300-D |

*Ask at Your Nearest "Oilwell" Store*
*For Complete Specifications*

OIL WELL SUPPLY COMPANY
USS OILWELL UNITED STATES STEEL

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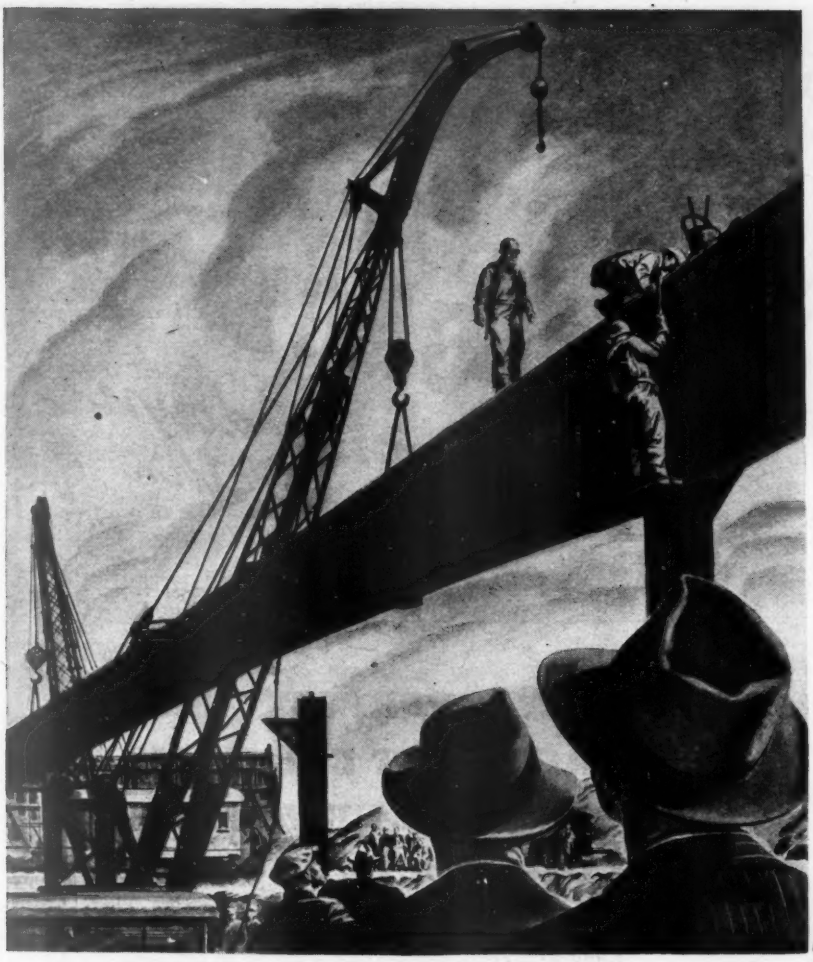
UNITED STATES STEEL

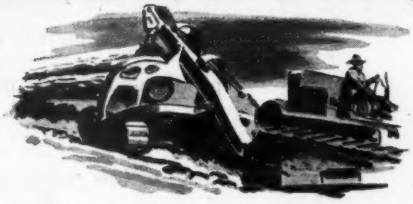
# "OILWELL"



# If you're a "Sidewalk Superintendent"

## -watch the wire rope

*Here's a show that scores a hit wherever it plays—building erection. These big cranes pick up steel girders and mesh them into place like the gears in your car. The star in the cab does it with levers and Preformed wire rope.*



*Logging machinery moves dead-weight logs with wire rope providing the sinews. Preformed wire rope gets top billing because it handles easier, resists kinking and stands the gaff.*

*Earth moving has come a long way since the day of the pick, shovel and wheelbarrow. Now bulldozers, shovels and trench hoes make the dirt fly—and their moving parts are actuated by wire rope, Preformed preferred.*

**On jobs like these and hundreds of others the new wire rope —Preformed—is breaking old performance records. Operators like it because it's safer and handles easier. The office likes it because it lasts longer and reduces time lost for replacement. It makes money by saving money.**

**ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR**

**IT HANDLES EASIER—LASTS LONGER**

# TANK GAGING *comes down to earth...*

## NOW...PERFECT TANK GAGING AT EYE LEVEL WITH THE NEW SMITH LIQUID LEVEL GAGE

Easy to install, even while tank is in service. Slip stream float is dropped down through 2" pipe—no internal guide wires needed. Three sizes for tanks of 25, 35 or 45 foot liquid height. High or low pressure—vapor tight for 2 or 300 PSI as required. It's revolutionary and inexpensive. May we give you complete information?

## SMITH METER COMPANY

**SUBSIDIARY OF A. O. SMITH CORPORATION**
Factory — 5743 Smithway, Los Angeles 22, California
SALES OFFICES: NEW YORK, CHICAGO, HOUSTON, LOS ANGELES
Local Stocks at Convenient Points • Local Agents in All Principal Cities

# *There is no better Line Pipe*

## than REPUBLIC ELECTRIC WELD

Here's why
1. INSPECTED INSIDE AND OUT
—no hidden defects
3. FLAT-ROLLED STEEL
—means uniform wall thickness
3. COLD-FORMED INTO PIPE
—assures freedom from scale
4. ELECTRIC RESISTANCE WELD
—proved 100% as strong as any point in the wall

In actual service—carrying crudes, gasoline, by-products and natural gas—more than 40,000 miles of Republic Electric Weld Line Pipe have proved that you can't beat this modern line pipe for dependable, trouble-free performance.

But don't take our word alone!

Talk to men who already are using Republic Electric Weld Pipe in their lines. Let them tell you about its many cost-saving advantages . . . about its consistent uniformity and extra long lengths which speed up laying time and cut construction costs. Ask them about its high strength and toughness—qualities which enabled it in one particular line to withstand pressures far in excess of those for which it was installed.

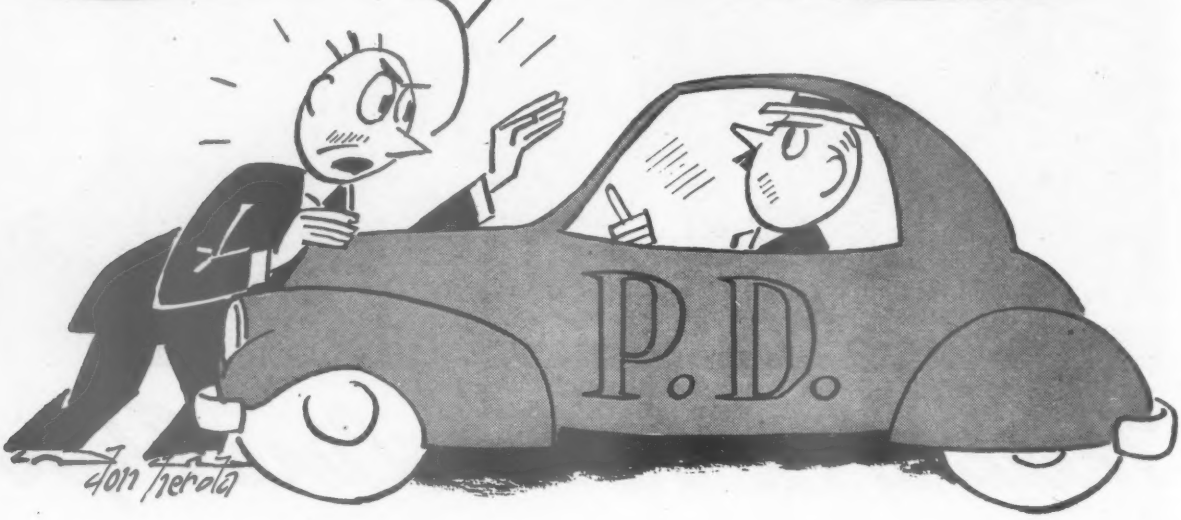
Then you'll see why more and more cost-wise oil and gas men everywhere agree that *there is no better line pipe than Republic Electric Weld.*

**REPUBLIC STEEL CORPORATION**
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

**REPUBLIC**
LINE PIPE
NORMALIZED CASING AND TUBING

Other Republic Products include Alloy Steels—

Even if your name is Phil Duttle, this car was built for Police use!




## QUICK FACTS ON REDBOOK

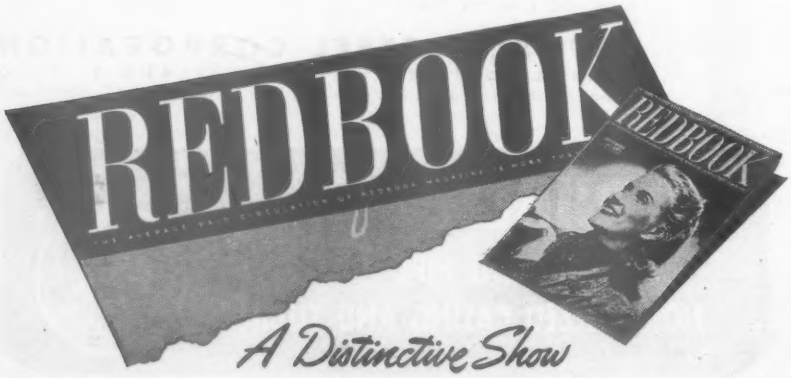
- You can buy a lot of gumdrops for 25¢, but that is no measurement of editorial responsiveness. Compare Redbook's 25¢ price against the cost of newspapers and most other magazines (5¢-10¢-etc.) Redbook buyers pay 25¢ an issue — BUY TO READ!
- High editorial percentage creates cover-to-cover interest.
- Twelve insertions in Redbook give you *continuity* in your advertising at a low cost — in fact, only $37,200 a year.
- 25¢ selling price contributes nearly $4,000,000 toward paying for the NATIONAL SHOW.
- Monthly issues guarantee longer life.
- Reader Research assures constant appeal.

NO question about it, auto DEMAND far exceeds auto SUPPLY. But this is only a temporary condition, certain to be reversed as time goes by.

So any promotional plans you make *now* will bear fruit at just the psychological moment.

That's why we suggest that you consider Redbook's NATIONAL SHOW FOR $37,200 A YEAR COMPLETE! A show reaching a cohesive and important audience of 1,500,000 families who enjoy good reading.

With more advertising space becoming available, it is high time to give consideration to Redbook's NATIONAL SHOW FOR ONLY $37,200.



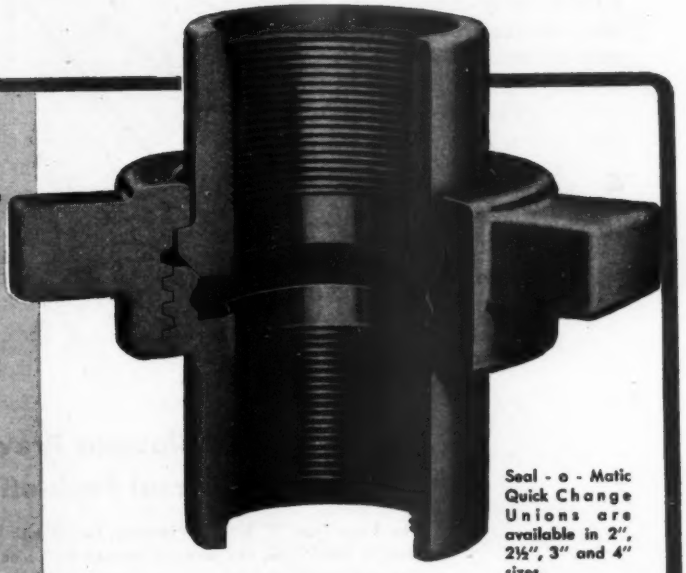

**To Nearly 1/5 of America—**
**A program of Proven Sales Power**

Redbook, Cosmopolitan, and American, THE 6 MILLION FAMILY MARKET, reach almost six million homes with less than 15% duplication — approximately one out of every five in the United States. *And a full page in every issue of all 3 magazines costs only $160,000 a year!*

# ...GUIBERSON'S SEAL-o-MATIC Quick Change Union is back again

**SEAL-o-MATIC** Quick Change Union will stand up to the toughest working conditions... a low cost investment which pays dividends by saving costly replacements and man hours in the field and assures a quick, dependable coupling for mud, cement, and acidizing lines, as well as for high pressure oil, gas, or water lines... ideal for Christmas Trees.

Guiberson's SEAL-o-MATIC Quick Change Union harnesses pressure within the line and puts it to work by the self-sealing action of the SEAL-o-MATIC Ring. This flexible ring of oil and acid resistant compound seals from line pressures, independent of the tightness of the wing-nut... and it seals either high or low pressures... makes up by hand. Field replacement of ring is easily accomplished.



Seal - o - Matic Quick Change Unions are available in 2", 2½", 3" and 4" sizes.

FLEXIBLE LIPS UTILIZE PRESSURE TO EFFECT A SEAL

RIB HOLDS SEAL-O-MATIC RING IN PLACE WHEN UNION IS DISCONNECTED

BETTER BE SAFE THAN SORRY GUIBERSON

Reg. U. S. Pat. Off.

Manufacturers of oil field equipment, steel cabinets, domestic oil heaters, sheet metal products and molded rubber products.

Guiberson U.S.A.

## THE GUIBERSON CORPORATION

Dallas, Texas Established 1919

California Distributor: The W. R. Guiberson Co., 717 East Gage Ave., Los Angeles
Export representative: I. Frank Brown, 30 Rockefeller Plaza, New York, N. Y.

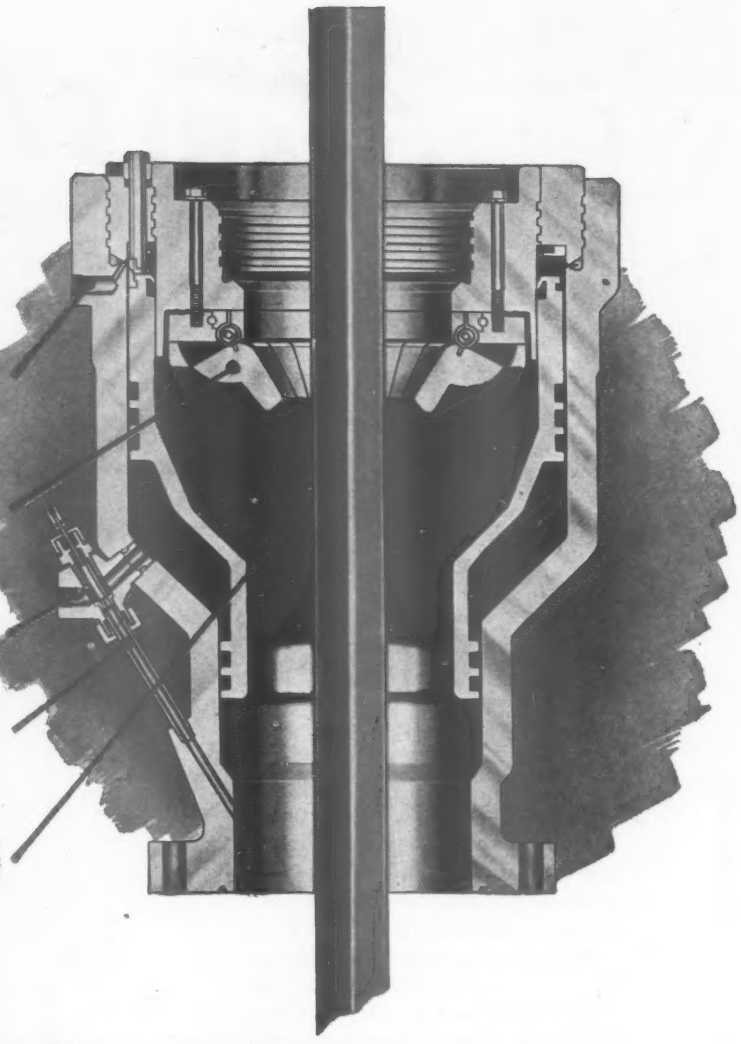
# THIS IS HOW THE TYPE "R" BLOWOUT PREVENTER WORKS

**1 PACKER CONTROL**
Admits pressure above the piston to regulate packer compression when stripping tool joints.

**2 PACKER SUPPORT**
Heavy metal segments which prevent the extrusion of packer rubber under pressure.

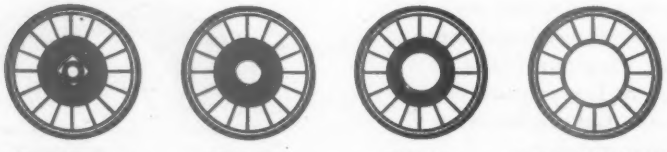
**3 INSTANT OPERATION**
Fluid under pump pressure admitted here, raises contractor piston and effects pack-off instantly when control valve is opened. Pressure from well entering chamber through slanting passage maintains safe secure seal automatically.

**4 POSITIVE PACK-OFF**
Thick, resilient packer withstands abrasion, cutting and wear without loss of sealing efficiency.



## The Simplest Blowout Preventer Gives You Universal Pack-off Service

No. 4 size Type "R" Blowout Preventer, for use with 13⅜" casing, passes any tool used in 13⅜" pipe, and packs off around 4¼" square kelly, 4½" drill pipe and any size casing, without change or removal of inside parts or cellar connection.



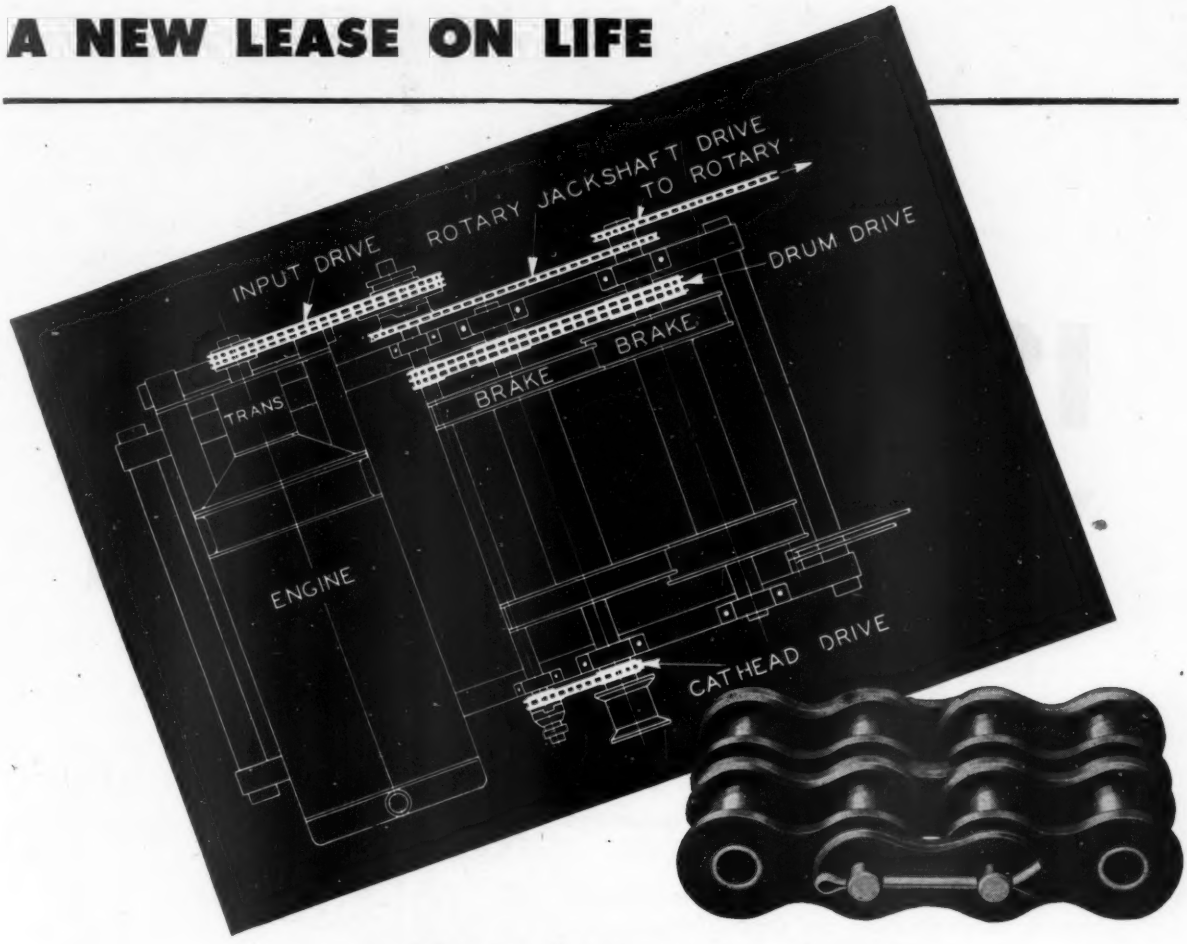
SQUARE KELLY | DRILL PIPE | CASING | MAXIMUM BIT PASSAGE

# HYDRIL

HYDRIL

HYDRIL COMPANY • 714 WEST OLYMPIC BLVD. • LOS ANGELES 15, CALIF.

# A NEW LEASE ON LIFE



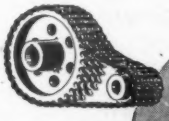

## . . . For Service Rigs!

A service rig is no better than the chains that drive it! So why not give your rig a new lease on life by replacing inefficient or worn chains with dependable Baldwin-Rex roller chains?

You'll find that with Baldwin-Rex on your rig you'll get a new high in service . . . a new low in maintenance and repair costs. They're built to take the toughest operating conditions without failure.

The secret of the superior performance of Baldwin-Rex roller chains lies in their quality construction. The finest engineering and design . . . the highest quality materials and workmanship combine to make them the outstanding roller chains in the fields.

Bearing areas are carefully heat-treated and finished to assure maximum strength and resistance to wear. Pins, bushings, rollers and side plates are machined to extremely close tolerances and assembled with precision force fits for long, dependable service. Replace with Baldwin-Rex.



**BALDWIN·REX**

**ROLLER CHAINS**

You'll find Baldwin-Rex roller chains for sale in all oil fields. For information, see your Baldwin-Rex Field Engineer, your local supply store or write direct to:

**BALDWIN-DUCKWORTH DIVISION OF CHAIN BELT COMPANY**

357 Plainfield Street, Springfield 2, Massachusetts

# IS ACID YOUR PROBLEM

*If you require large or moderate quantities of sulphuric or other acids . . .*

*If your methods of acid production, recovery or concentration are unsatisfactory . . .*

*If you wish to obtain the benefits of the latest developments in acid plant processes . . .*

CHEMICO
CHEMICAL CONSTRUCTION CORP.

## . . . consult CHEMICO

The CHEMICO organization has specialized in acid plant design and construction for more than thirty years. During this time over 600 world-wide installations have provided CHEMICO with a wealth of performance data for a wide range of requirements and operating conditions. Many of the advances in processes for the production, recovery and concentration of heavy acids have been developed by CHEMICO technologists. The services of this organization include not only the design and construction of acid plants but also the origination of processes when necessary, and overall guarantee of plant equipment and production.

You have all these assurances of authoritative recommendations and successful results when you consult CHEMICO for your acid requirements. Your request for consultation involves no obligation on your part.

## CHEMICAL CONSTRUCTION CORP.

*A Unit of* AMERICAN CYANAMID COMPANY EMPIRE STATE BLDG. 350 FIFTH AVE. NEW YORK 1, N. Y.

EUROPEAN REPR.: CYANAMID PRODUCTS, LTD., BERKHAMSTED, HERTS., ENGLAND. • CABLES: CHEMICONST, NEW YORK CC-100

CHEMICO PLANTS are PROFITABLE INVESTMENTS

# ENGINEERED...

## TO PROVIDE THE MOST IN FOUR-WHEEL-DRIVE HAULING POWER AND STAMINA

ROBERT YARNELL RITCHIE PHOTO

THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

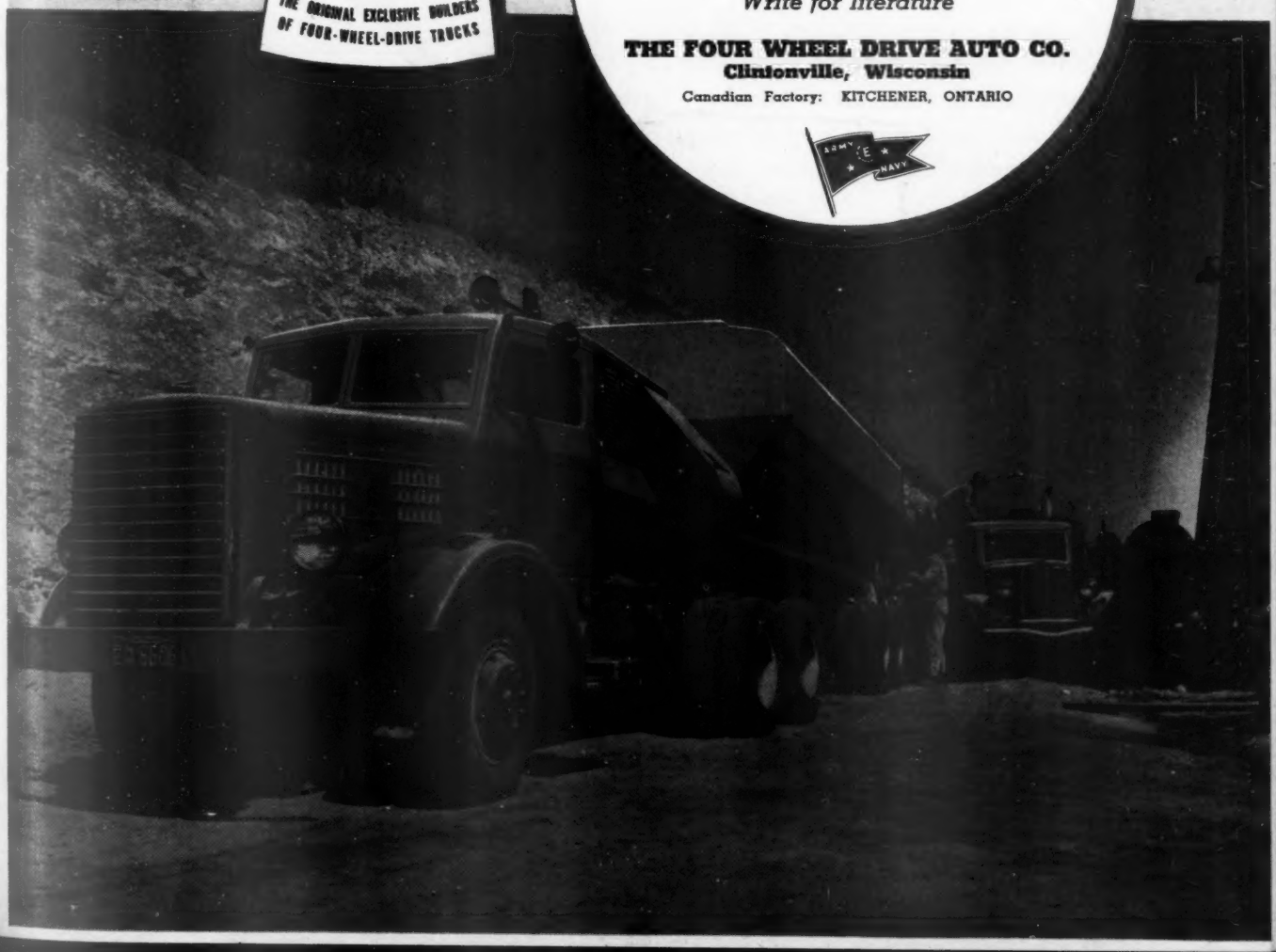
Oil-field truck-engineering experience accounts for FWD's reputation for reliability with oil-field men.

Close contact with the needs of many oil-field organizations has enabled FWD engineers to provide the most in truck hauling power and stamina — to apply the four-wheel-drive principle to greatest advantage — to gain the most in powered traction, equalized power and load distribution, the ample reserve power and rugged construction required to meet every condition and emergency in oil-field service.

FWD builds a complete line of four and six-wheel drive trucks —

*Write for literature*

**THE FOUR WHEEL DRIVE AUTO CO.**
**Clintonville, Wisconsin**
Canadian Factory: KITCHENER, ONTARIO



# WE LAY 91,200 HORSE POWER ON THE LINE

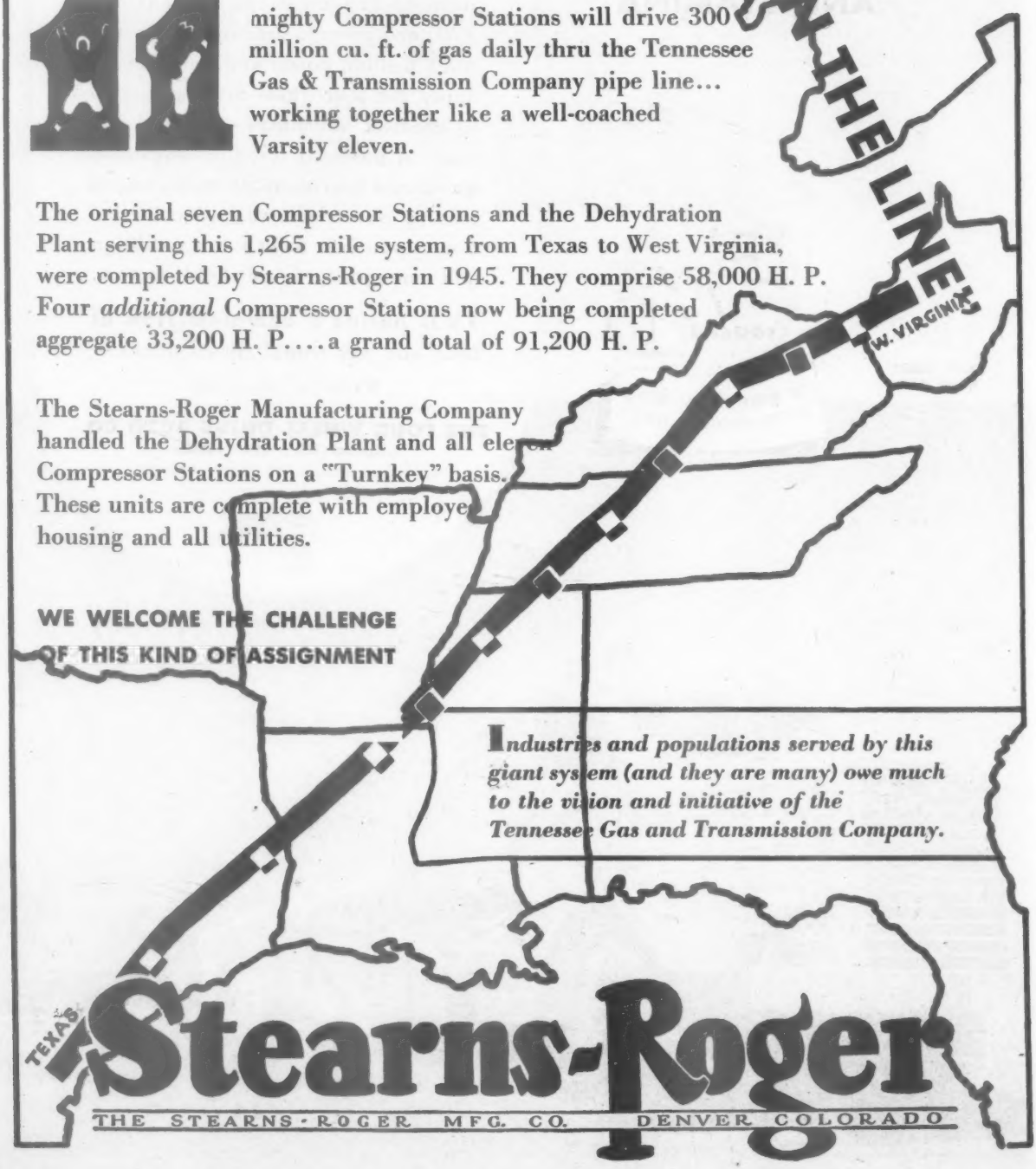


mighty Compressor Stations will drive 300 million cu. ft. of gas daily thru the Tennessee Gas & Transmission Company pipe line... working together like a well-coached Varsity eleven.

The original seven Compressor Stations and the Dehydration Plant serving this 1,265 mile system, from Texas to West Virginia, were completed by Stearns-Roger in 1945. They comprise 58,000 H. P. Four *additional* Compressor Stations now being completed aggregate 33,200 H. P.... a grand total of 91,200 H. P.

The Stearns-Roger Manufacturing Company handled the Dehydration Plant and all eleven Compressor Stations on a "Turnkey" basis. These units are complete with employee housing and all utilities.

**WE WELCOME THE CHALLENGE OF THIS KIND OF ASSIGNMENT**




*Industries and populations served by this giant system (and they are many) owe much to the vision and initiative of the Tennessee Gas and Transmission Company.*

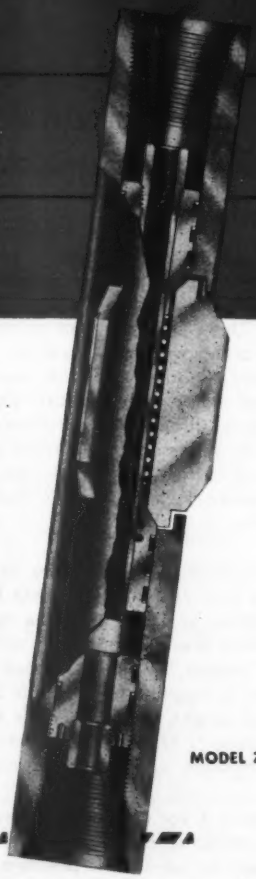
# Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

# GRANT HYDRAULIC CASING SCRAPER

## PRESSURE CONTROLLED SCRAPING ACTION (AN EXCLUSIVE GRANT FEATURE)

## ASSURES COMPLETE REMOVAL OF CEMENT, MUD, SCALE AND BURRS FROM INSIDE OF CASING



MODEL 7447

**The inside surface of the casing is clean and smooth for all future work. Packers and swabs can be set or operated without damage to the rubbers and cement retainers can be run properly. When drilling out after a cement job include a GRANT HYDRAULIC CASING SCRAPER directly above the bit. It embodies exclusive GRANT features that promote a cleaner, more efficient job—it is hydraulically operated by pump pressure from the rig floor, thus providing any degree of pressure of the scraping blades on the inside of the casing. "Chattering," "bouncing" and inefficient scraping action are eliminated. Another factor of extreme importance is that the scraping blades remain in a collapsed condition while running in the hole, and are expanded by pump pressure only when scraping operation is to be started. The blades are sharp and free from wear when scraping begins—an assurance of a cleaner, more efficient job.**

Grant

**OIL TOOL COMPANY**

2042 EAST VERNON AVENUE
LOS ANGELES 11, CALIFORNIA

*Branches:* AVENAL, BAKERSFIELD, SANTA MARIA, VENTURA, CALIFORNIA • ODESSA, TEXAS

GRANT OIL TOOL CO.
2042 EAST VERNON AVENUE,
LOS ANGELES 11, CALIFORNIA.

Please send me, without obligation, complete information on the GRANT Tools checked below.

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

☐ Bailers ☐ Cleaners ☐ Hole Enlargers ☐ Liner Pullers
☐ Reamers ☐ Shale Bits ☐ Underreamers ☐ Wall Scrapers
☐ Safety Automatic Pressure Releases (Mud Pumps)

# Dependable Accurate Portable GRAVITY METER

## Mountable in "Jeep" or Sedan .... Can be carried on horseback or back-pack to remote locations.

Light weight and compact, the North American Gravity Meter is particularly suitable for operation in rugged territory. It can be mounted in a small "Jeep" or rear seat of standard sedan, for transporting wherever a car can go, off or on the highway. Readings can be made without removing the meter from the car, simply by extending the tripod through the car floor. When the terrain becomes impassable by car, the meter can be lifted out and carried on the back-pack by one man or on horseback, in a boat, or canoe to the desired location.

The North American Gravity Meter weighs only 28 pounds, without battery. When in a car, it can be operated from the car battery. A motorcycle battery, weighing about 12 pounds, is supplied for portable use. Overall height, including dials and projections is 17 inches. Diameter is 11 inches.

The Meter is not affected by outside temperature. It is completely compensated for barometric pressure, so that corrections are unnecessary. Orientation is not necessary, as the system is non-magnetic. All electrical parts are within the meter case, protected from humidity.

Lease or purchase of the North American Gravity Meter enables your field party to make accurate, rapid, gravity meter surveys at a decided saving in cost. Dependability of the Gravity Meter is demonstrated by lack of repairs or service during long periods of operation in the field.

Those interested in or planning foreign or domestic Gravity Meter surveys should write for complete information.

# NORTH AMERICAN GEOPHYSICAL CO.

*Gravity-Magnetic-Seismic Surveys* · *Geophysical Apparatus*

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# FIELD HOUSING is No Longer a PROBLEM

Field housing is no longer a problem for companies that specify STURDYBILT prefabricated, demountable buildings. We are prepared to save you time, worry and money by being responsible for your entire field housing problem from plans to erection on the site.

Specify STURDYBILT whether you need one small tool house or an oil field camp. The STURDYBILT 4' X 8' wall sections, precision built at the factory, can be adapted to suit nearly any floor plan, and they're easy to transport and erect. Write for Information.

*MANUFACTURERS OF SPECIAL MILLWORK; DISTRIBUTORS OF JOHNS-MANVILLE INSULATION, ROOFING AND SIDING SHINGLES; CURTIS WOODWORK.*

STURDYBILT

**SOUTHERN MILL & MANUFACTURING CO.**

• TULSA, OKLAHOMA •

***Prefabricated, Demountable Houses***

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125-45 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

REPAIRS SPEEDED

DOWNTIME REDUCED

COSTS CUT . . .

# by LUNKENHEIMER

## Interchangeable Parts

**Maintenance men find their job made easier and operating efficiency stepped up by Lunkenheimer interchangeablity of parts.**

**In servicing the Bronze "Renewo" and Iron Body "Ferrenewo" Valves—both regular and plug types—only *one stock of parts* is required. *All* parts (except bodies and bonnet rings) are made exactly the same and fit each other perfectly.**

**Repairs are more quickly and easily made, ordering and handling are simplified. The result: Lower maintenance cost and low ultimate valve cost.**

**Lunkenheimer part-interchangeability is fully illustrated and described in Circular No. 567. Ask your Lunkenheimer Distributor for a copy, or write direct.**

BRONZE
200 lb. S. P.
"RENEWO"

IRON BODY
150 lb. S. P.
"FERRENEWO"

### VALVE MAINTENANCE SIMPLIFIED!

All parts of these valves (except bodies and bonnet rings) are exactly the same. They fit each other perfectly.

For example—if you need a stem, disc, or seat ring for the "RENEWO", you can use the corresponding part of the "FERRENEWO", and vice versa.

Thus there are fewer parts to be carried, repairs are more quickly and easily made. The labor, time, and expense of valve maintenance is cut down—'way down!

SEE YOUR LUNKENHEIMER DISTRIBUTOR!

Lunkenheimer Distributors are located in all industrial centers. There is one near you—have him demonstrate with actual samples the interchangeability of parts in "RENEWO" and "FERRENEWO" Valves. It's a big time and money saver for any plant!

### • SAVE THIS WAY, TOO! •

For severe throttling service, a regular type can be converted into a plug type, by simply changing the seat and disc, without taking the valve out of the line.

Thus it's not necessary to buy a whole new valve—just a matched set of plug type seat and disc which interchange perfectly in corresponding patterns and sizes in a range of pressures from 150 to 350 lb. S. P.

Lunkenheimer simplicity of design, minimum number of parts, and fine precision workmanship make this and other outstanding economies possible.

Fig. 16
300 lb. S. P.
Bronze "RENEWO"

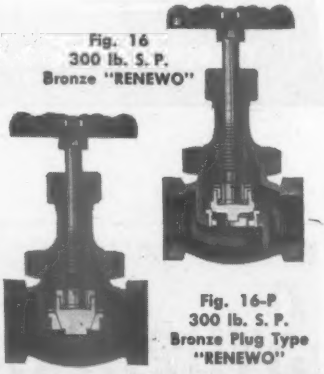

Fig. 16-P
300 lb. S. P.
Bronze Plug Type
"RENEWO"

**THE LUNKENHEIMER CO., Cincinnati 14, Ohio**

(OFFICES: NEW YORK 13, CHICAGO 6, BOSTON 10, PHILADELPHIA 7.
EXPORT DEPARTMENT: 318-322 HUDSON ST., NEW YORK 13, N. Y.)

CASING PROTECTORS • STABILIZERS • PIPE WIPERS • WIRE LINE GUIDES • WIRE LINE WIPERS • KELLY WIPERS
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TRAVELING BLOCK BUMPERS • TUBING PROTECTORS • SUCKER ROD WIPERS • TUBING WIPERS

# A Sure Shot in Mud Mixing

**The New Speed Mixer Mud Gun**
**All Steel Construction. Wt. 92 lbs.**
**Code: MUDDLER**

1. Steel, no-leak handle
2. Cast Iron Counterweight (accessory)
3. Alemite Fitted
4. Polished Chrome Faced Goosenecks for Long Life of Packing and Glands.
5. Upper & Lower Surge Chambers for Complete Mixing
6. Divided, Balanced Flow
7. Vertical Plane Locking Arm—Horizontal to Full 90° Downward Jetting
8. Horizontal Swivel Joint and Spin-proof Lock
9. Hammer Union for Quick Connection
10. High Pressure Inlet—Standard Pipe
11. PBX Special Rubber-lined Nozzle
12. Base Accessory Wt. 250 lbs. for heavy duty, Code: PLAYA

## "MUDDLER"
### The Speed Mixer Mud Gun

The tougher the drilling problem, the more important is mud control. Science has developed better and better muds as holes go deeper. But, it is still up to the operator to mix it and keep it mixed in order to make it do the job it was cut out for. Motion is the secret of mud mixing . . . the kind of motion delivered by a Patterson-Ballagh Mud Gun.

The "Muddler" Mud Gun is a high pressure, speed mixer. After thorough mixing and agitation in the two chambers, the mud jets powerfully into the pit to keep the mud moving and prevent the extra weight material from settling out. Easy to set up on a sturdy portable base, it balances, locks and stays put without spinning and under the highest pressures. It is good for extremely heavy duty under any and all oil field conditions today.

The Patterson-Ballagh "Muddler" is truly an all purpose gun, but especially good for breaking up weight and mud conditioning materials. It saves time, labor and handling, and aids in gas release, cooling, mixing and maintaining suspension of mud material.

Patterson-Ballagh features several excellent Mud Guns. "MUDDLER" is the code name for ordering the type shown here. The base, weighing 250 lbs., available as an accessory without Gun. If desired, order Code Name *"PLAYA."*

*COMPLETE INFORMATION ON REQUEST, OR ASK YOUR PATTERSON-BALLAGH FIELD MAN*

*Specify*
PATTERSON-BALLAGH
LOS ANGELES 1 • HOUSTON 10 • NEW YORK 6
*"Best Bet Yet"*

**PATTERSON-BALLAGH**
**MUD GUNS**
With PBX Special Rubber-Lined Nozzle

THE METRIC
RESET CONTROLLER
AMERICAN METER CO.
METERS
BULLETIN E-
Bulletin E-24 will be of interest to every instrument man. It gives full data on the design and simplicity of operation of this new development in process control.
CONTROL HEAD
REGULATOR
LINKAGE SYSTEM
BELLOWS ASSEMBLY
TRANSFER VALVE
RELAY

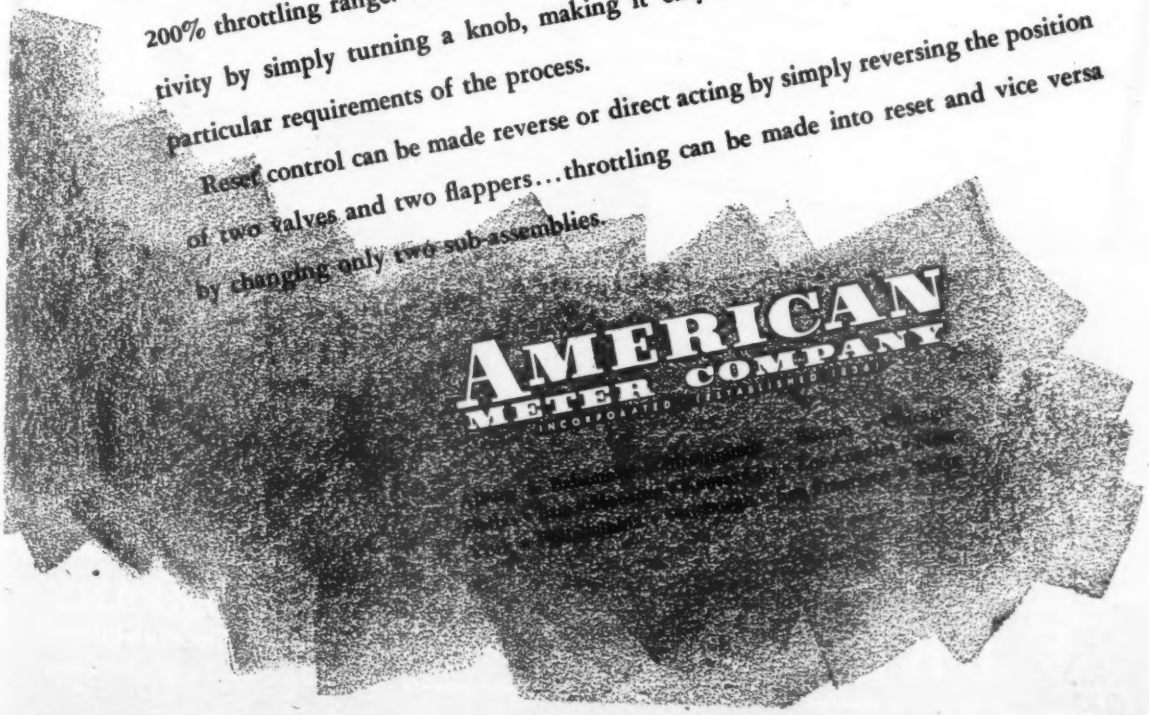
# Newest data on— RESET CONTROL

You can now get full data on the Metric Reset Controller in this new bulletin describing in detail its design and simplicity of operation.

This instrument has many unique features. Its operation is based upon only five major sub-assemblies, each of which is interchangeable with those in other reset controls of Metric manufacture.

The sensitivity of the instrument is readily adjustable from less than 1% to over 200% throttling range. This adjustment provides smooth uniform changes in sensitivity by simply turning a knob, making it easy to adapt the instrument to the particular requirements of the process.

Reset control can be made reverse or direct acting by simply reversing the position of two valves and two flappers... throttling can be made into reset and vice versa by changing only two sub-assemblies.




2308

# *New* "PRECISION" UTILITY BATH

***Temperature range 35 to 200° C.; accuracy plus or minus 1°***

**Designed specifically for utility laboratory requirements that demand a compact bath with good sized working chamber, accurate, easy setting controls and rugged construction. The many excellent construction, insulation and operating features provide ample assurance of continued even temperature control within the rated tolerance. Particularly useful to the laboratory with a moderate equipment budget in need of a utility bath capable of filling the requirements for many A.S.T.M. tests.**

## FEATURES

**CONSTRUCTION**—Outer jacket is heavy, galvannealed iron, finished in high aluminum. Interior is stainless steel.

**HEATING ELEMENT**—Steel sheathed immersion heater, capable of bringing bath up to temperature quickly from a cold start.

**TEMPERATURE CONTROL AND HEATING MEDIUM**—Hydraulic thermostat utilizes a liquid expansion coil which provides uniform, constant temperature. Heating medium is oil, bath capacity 19 gallons.

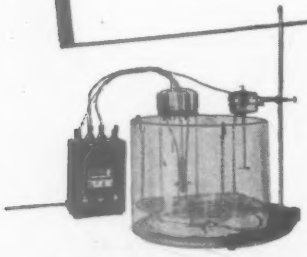
**INSULATION**—Three inches of glass wool, insulates bath against room temperature fluctuations, reduces wall losses and insures temperature control accuracy and uniformity.

**CIRCULATION**—Ball-bearing, fully enclosed, resilient mounted, motor stirrer designed specifically for continuous duty.

**WORKING CHAMBER**—25" high x 24" wide x 24" deep. Provides ample space for support stand with upper and lower shelf which can be furnished.

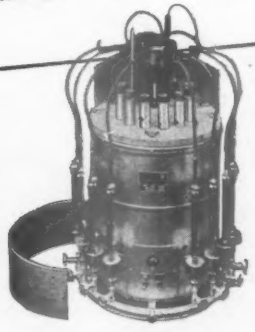
**ELECTRICAL CHARACTERISTICS**—115 Volts, 60 Cycles, A.C. 3000 watts.

**SPECIAL NOTE**—The "Precision" line of constant temperature baths is unquestionably the largest most complete line ever offered to the laboratory. No matter what your problem is it will pay you to investigate the many standard and specialized "Precision" models available. Write for temperature control catalog No. 325-R.

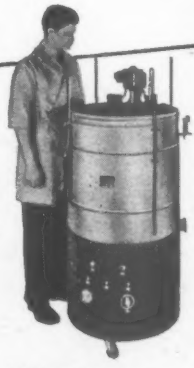


T-9452 Pyrex glass "Visibility" bath for utility use, also for viscosity determination using Ubbelohde or modified Ostwald Viscosimeters. Several standard sizes.

T-9273 Sterilizing bath, range 100 to 160° C., built to contain light oil or alcohol. Has stainless steel interior and exterior, four perforated stainless steel baskets, condenser for recovery of sterilizing medium.



T-8723 British Air Ministry oxidation bath to test aviation lubricants at controlled temperature, with controlled air introduction into oil samples.



T-8589 Refrigerated constant temperature bath, portable and self-contained range 10 to 100° C. plus or minus .03° C. Compressor built into base. Illuminated interior 20" dia., 20" deep. Transite cover split in two halves.

*See Your Laboratory Supply Dealer.*

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## the modern way to make metals last

### THE U. S. NAVY AND MARITIME COMMISSION

changed from red lead to zinc chromate primer because of:

1. Much greater rust resistance.
2. A tougher, more adhesive film.
3. Quicker drying. Recoats in 5 hours.
4. No lead poisoning.
5. Lower cost.

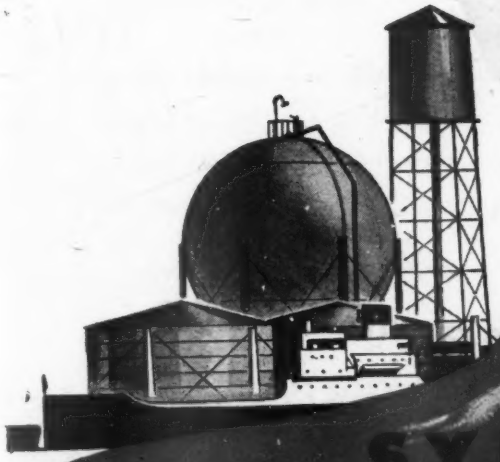
**Syncro-Green is the outstanding Zinc Chromate primer *because*—**

**ZINC CHROMATE PIGMENT,** the *only* known *active* rust inhibitive pigment...

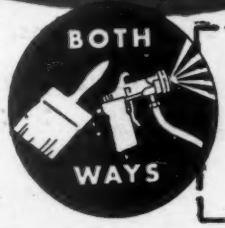
+ **SYNFLEX,** quick dry, alkyd, water resistant resin, made exclusively by ourselves...

+ **OUR EXPERIENCE** through having manufactured over two million gallons of zinc chromate primer during the war...

= **SYNCRO-GREEN METAL PRIMER,** the primer that makes all metals last.



# SYNFLEX SYNCRO-GREEN METAL PRIMER

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*We are interested in learning more about Syncro-Green — the modern metal primer now released to industry.*

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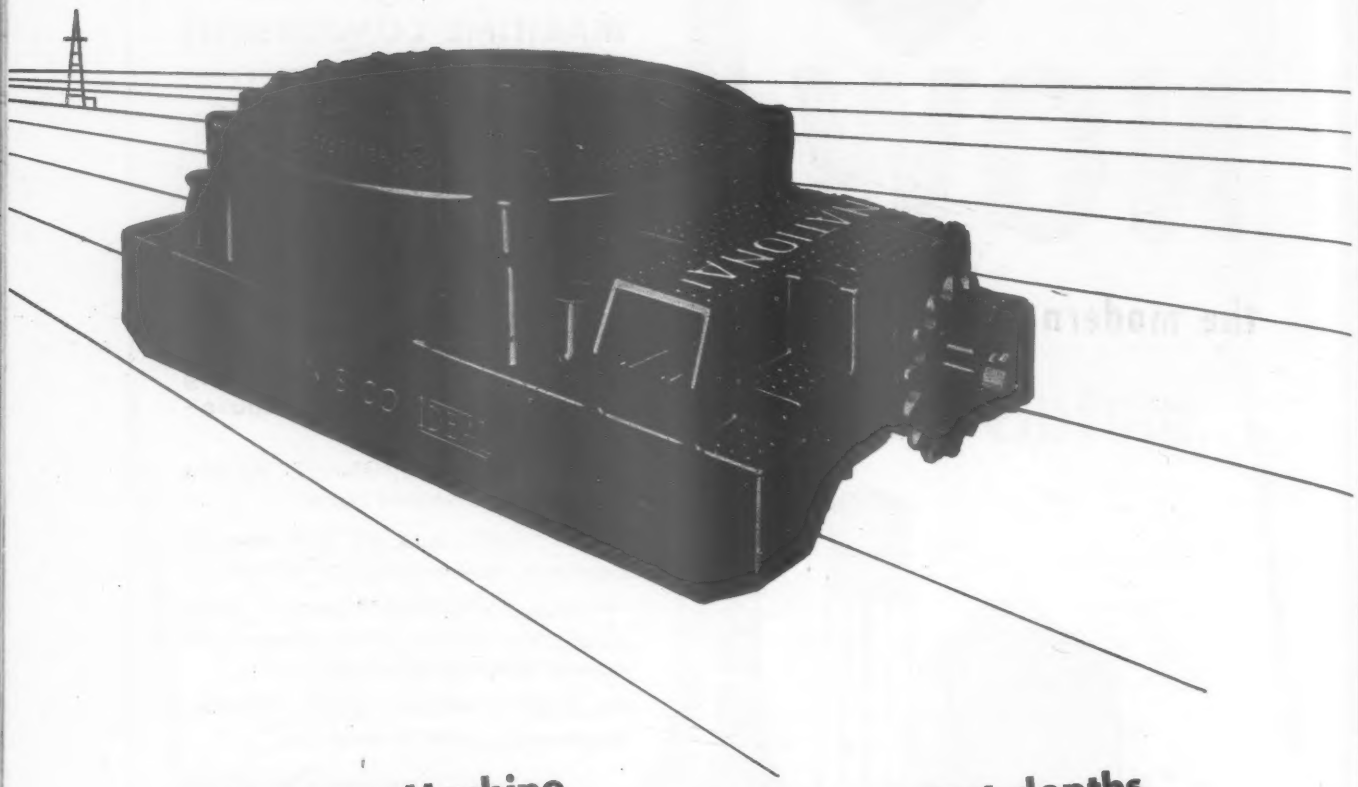
*When writing mention Oil and Gas Journal*

# IDEAL SHS 20½

"Reg. U. S Pat. Off"




**A Rotary Machine**
**for the highest speeds and the greatest depths**

THE NATIONAL SUPPLY COMPANY

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EXPORT: NATIONAL SUPPLY EXPORT CORPORATION, 30 ROCKEFELLER PLAZA, NEW YORK, N. Y., U. S. A.; RIVER PLATE HOUSE,

The SHS-20½ provides many features developed from field research. Proven by actual field performance, this rotary has established many outstanding records and is most popular for superior high speed performance in deep well drilling.

**HEAVY DUTY TABLE BEARING.** Ball bearings for both the main and hold-down bearings. Especially designed for high rotating speeds and heavy loads.

**PRECISION GROUND AND HEAT TREATED BEARING RACES.** Made from special Ideal Electric Alloy Bearing Race Steel, heat treated to obtain uniform hardness through their entire section.

**SPIRAL BEVEL GEARS.** Shock resistant spiral-cut teeth with flame-hardened driving faces assure a smoother and quieter running machine, together with greatly increased strength and wearing qualities. The gears are made from Ideal Electric steel.

**LARGER PINION SHAFT** of heat treated alloy steel forging, adjustably mounted in two individual bearing housings which bolt to the under side of the base. Entire assembly is removable as a unit.

**MUD SEALS.** A double tongue-and-groove labyrinth between the table and base prevents the entrance of mud or the escape of oil. Special labyrinths protect the inner and outer pinion shaft bearings. Oil seal rings further prevent the intrusion of mud or the escape of grease.

**OIL BATH LUBRICATION** for the main bearing and gears. Bearing and pinion operate continually in oil.

**PINION SHAFT LOCK.** The lock pawls and operating handles are fully protected in the base. The handles have a convenient push-pull action and are easily accessible from the side opposite the draw works.

**TABLE BEARING ADJUSTMENT.** Simplified bearing adjustment with a threaded adjusting ring.

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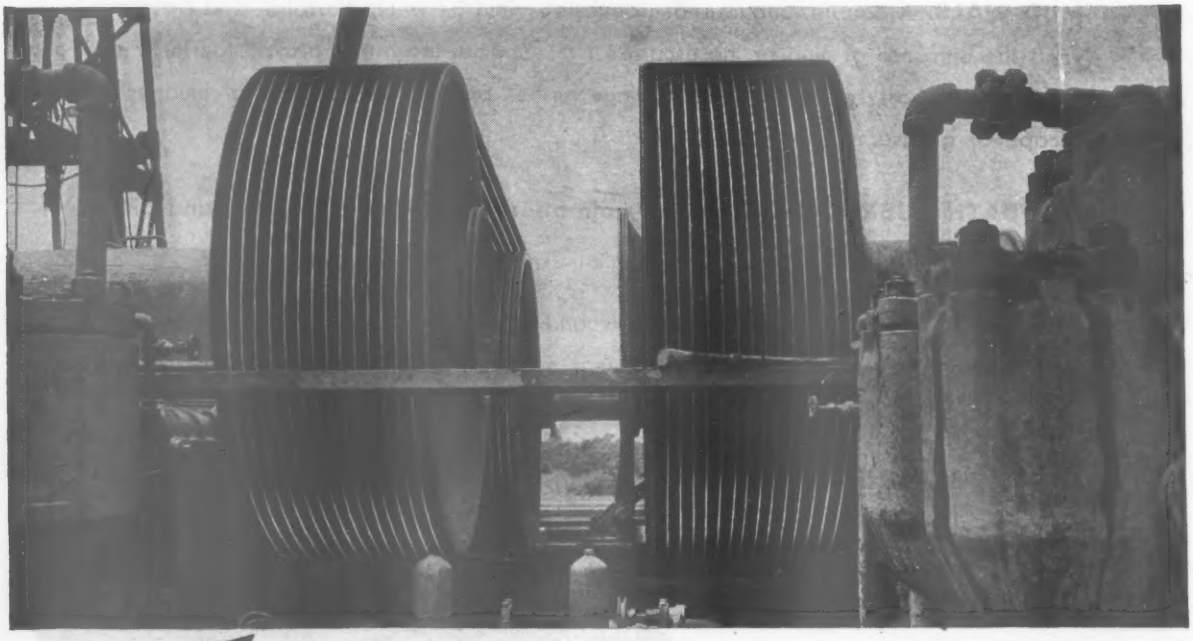
## Dayton Power Transmission Drives are Rugged...Designed for Outdoor Work

Weather in any form—rain, heat, cold, humidity—does not affect the performance of Dayton V-Belts. Nor does dirt, dust, oil or grease. That's because Dayton V-Belts are engineered for the severe operating conditions of the oil fields.

There are many other features that make Dayton V-Belts preferred for oil field service. They are prestretched. Therefore, "take-ups" are seldom needed. There is no cause for worry about slack belts on isolated pumps, for instance. They smooth out starting and stopping; will not transmit vibration; relieve the shock and running loads on bearings; assure a positive speed with their greater gripping power.

But this is not all. Through the Continental Supply Company, on-the-spot stocks are maintained at all times. Further, this company's oil field experts are available to give you power transmission counsel right in the field. Just call or write the Continental Supply Co., Dallas, Texas, or—

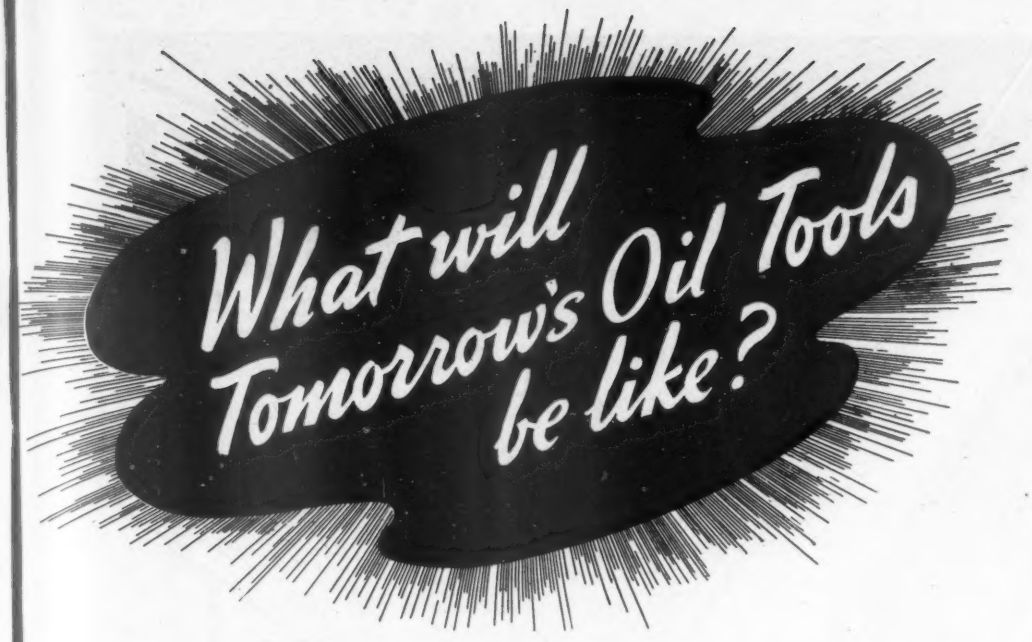
THE DAYTON RUBBER MANUFACTURING COMPANY
DAYTON 1, OHIO



V-Belts by Dayton Rubber

THE MARK OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER

SERVICE BY Continental




NOBODY KNOWS — yet. But you can be certain that the line of tools we will soon announce will have the touch of tomorrow in their performance and design.

For several years we have been studying your needs and developing a line of tools that will help you get the job done faster and safer at a lower cost.

Our plant, the Consolidated Machine Works, long known as one of the leading shops for high precision machine work, is now being expanded to manufacture these products.

As they prove their merit, these new tools will be announced. Study them and try them out. You will be money ahead in the long run.

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**Through constant research and personal contact every Jarecki store manager keeps abreast of *local* needs, enabling him to adapt his stock to the special requirements of those he serves.**

**With branch stores in many fields, we are at your beck and call, ready to provide what you want when you want it. The Jarecki habit is a good habit to cultivate.**

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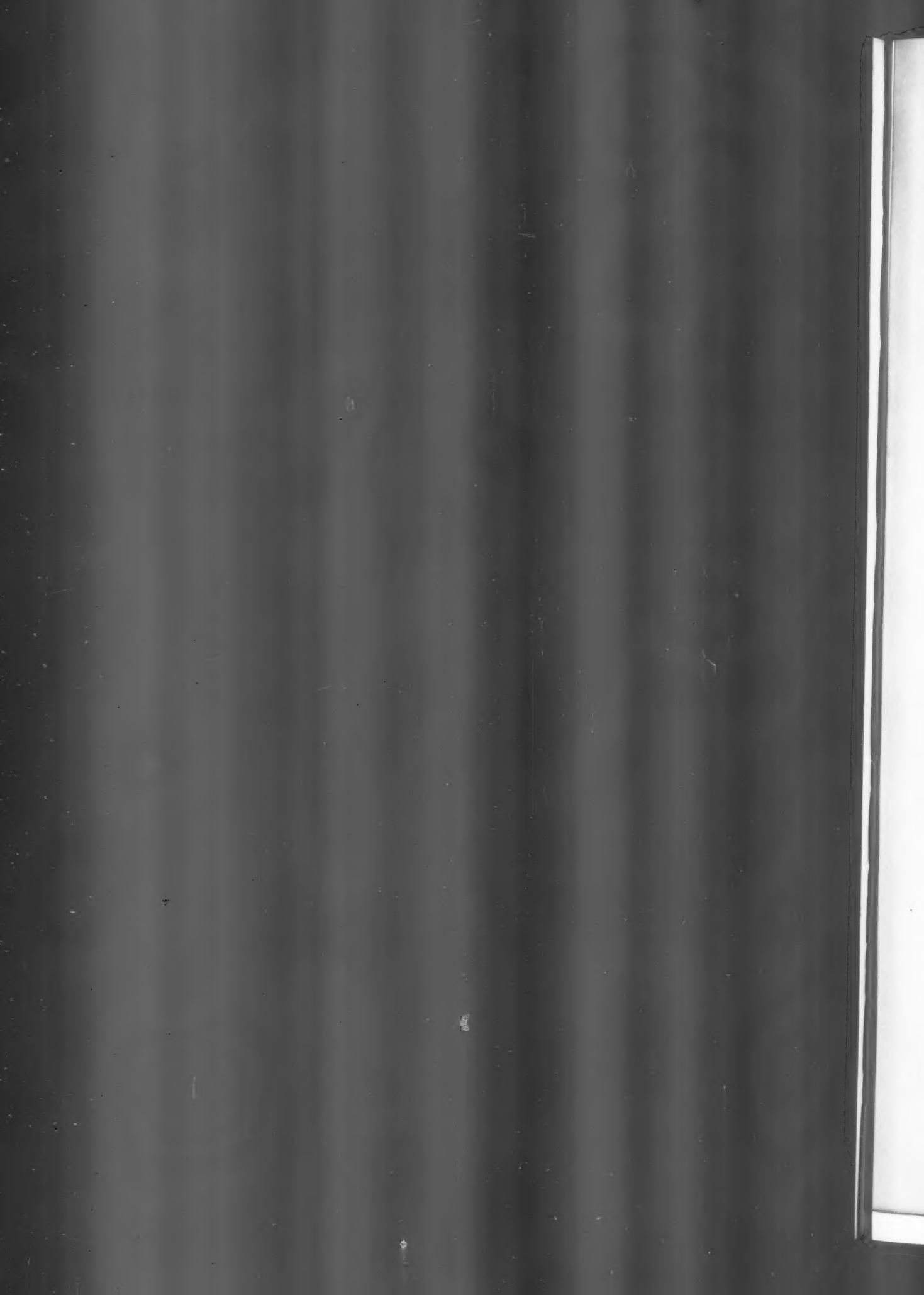
BRANCH STORES AT ALL IMPORTANT PLACES IN THE OIL COUNTRY



*There is a size and type* ***LOUIS ALLIS*** *electric motor for every industrial requirement.*

**THE LOUIS ALLIS CO., MILWAUKEE 7, WIS.**

# *R.P.M. and H.P. alone won't do!*

**If you are planning a new product that will require a special electric motor in its construction, our engineering development department will welcome the opportunity of working with you.**

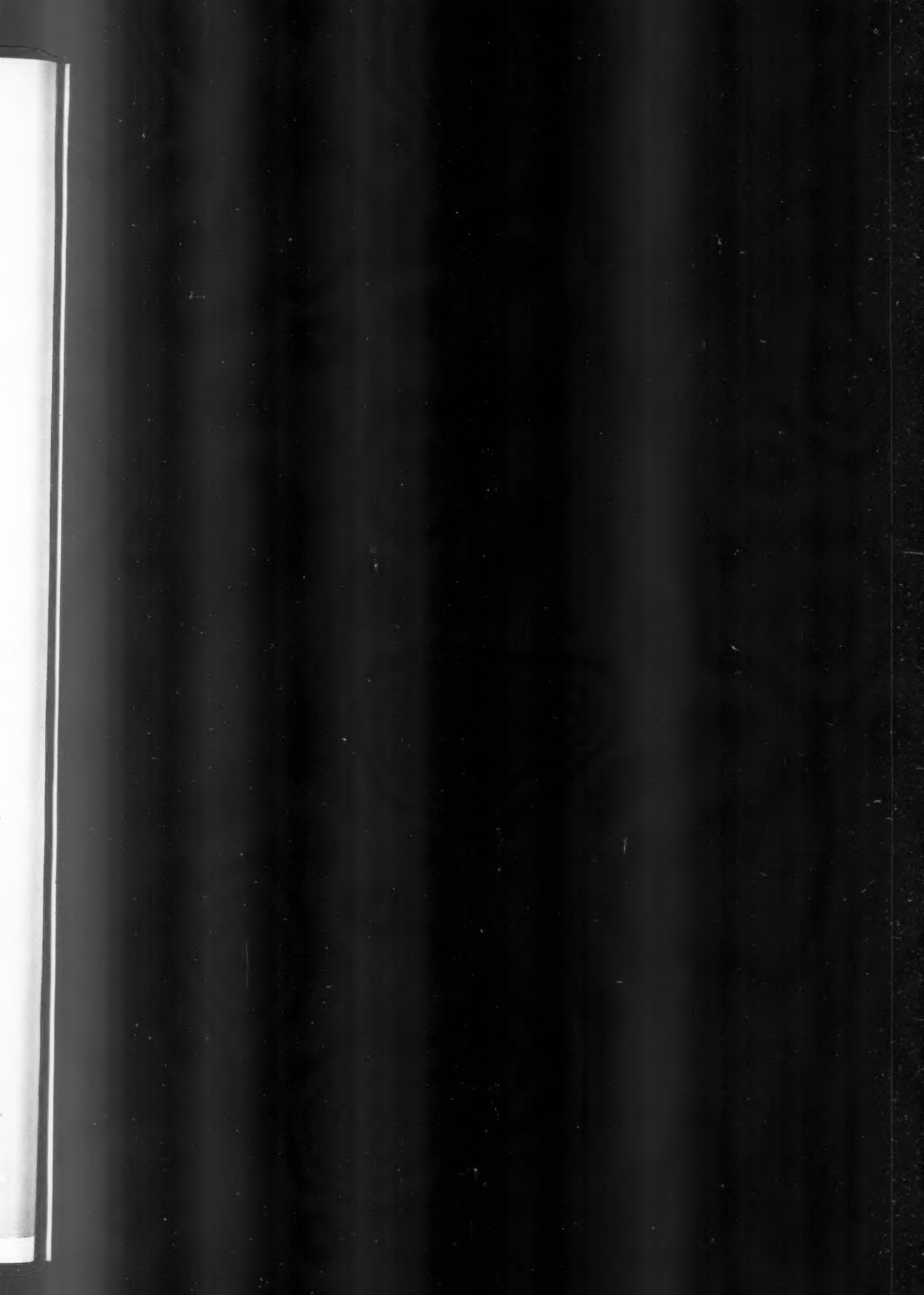
***For over forty years we have been developing special motors for special jobs — and during the recent years many outstanding improvements in electric motor design, construction and performance have been created by us —***

* * *

***Machinery designers no longer attempt to use a standard motor for a special job — it is much more economical and efficient to obtain a motor with exactly the electrical and mechanical characteristics required to perform a specific job than it is to try to doctor up a standard "shelf" motor to do the job.***

**No matter what your electric motor requirements are — we will welcome the opportunity of serving you — your needs will receive our most prompt and careful attention in every way.**

**THE LOUIS ALLIS CO., MILWAUKEE 7, WIS.**



# What does it cost to produce your oil

That is an important question—because the lower the cost—the greater the profit.

More and more producers, both large and small, are realizing the efficiency and economy of The Nixon Surface Control Gas Lift to lift their fluid.

The Nixon Gas Lift not only costs less to begin with — but over a lengthy period of time, it really proves its economy by trouble free performance.

Many Nixon Units have been in continuous service five years or longer — without the tubing ever being pulled. Why not investigate this modern method of producing oil?

***Contact your nearest Wilson Supply Co. store or write***

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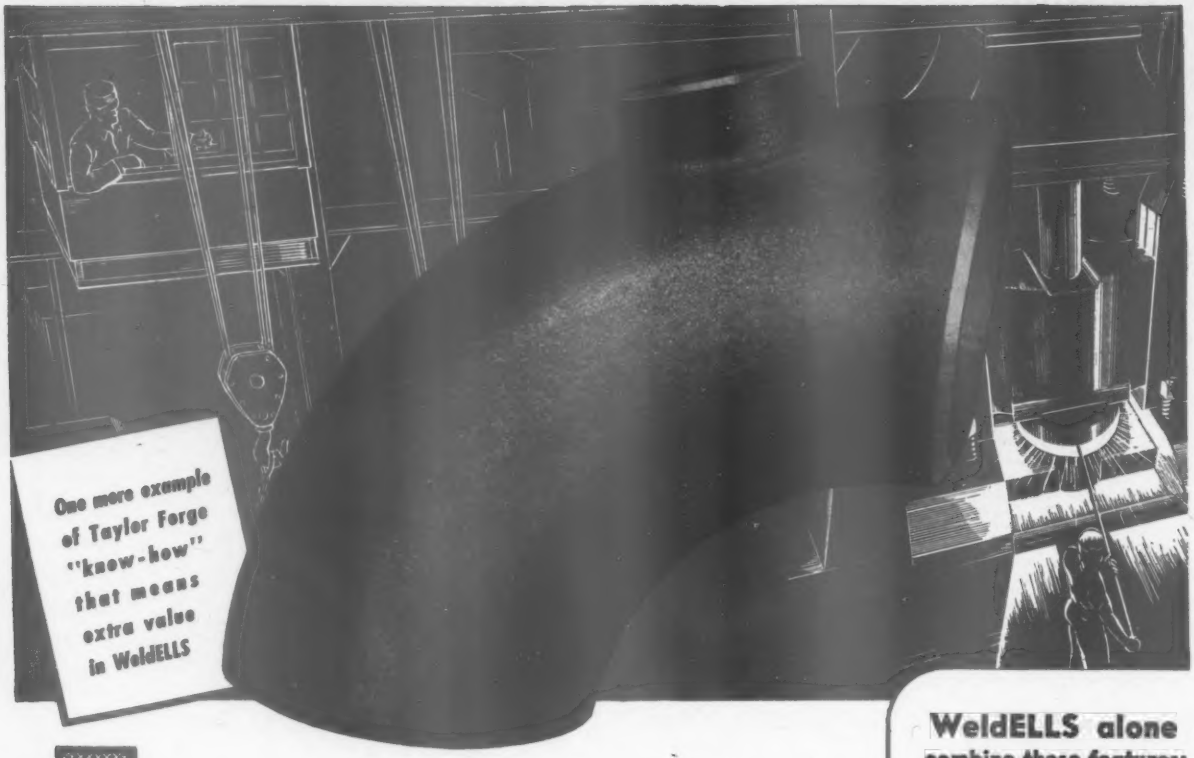
SALES OFFICES: Tulsa, Oklahoma; Dallas and San Antonio, Texas. LOS ANGELES: Western Pressure Control, 5700 Santa Fe Ave. TRINIDAD, B.W.I.: Neal Massey Eng. Corp.

BRANCH STORES: TEXAS—Kilgore, Beaumont, Barbers Hill, Bay City, Monahans, Alice, Victoria, Corpus Christi, Columbus. LOUISIANA—Lake Charles, New Iberia, Harvey, Shreveport. ARKANSAS—Magnolia. MISSISSIPPI—Natchez.




# There's always another one for us!

★ *Just when we think we've seen everything in special forged fittings another tricky requirement turns up . . . and probably always will. This time it's an order for seven-inch carbon-moly WeldELLS with integrally formed 3-inch outlets in their back walls.*

*We have solved problems that are a lot tougher than this, but none exactly like it. Thus, like hundreds before it, it has contributed its share to the sum total of Taylor Forge "know-how" . . . is one more proof that we have honestly earned our reputation for doing things with hot metal no one else does.*

THE unduplicated experience of Taylor Forge in the field of special forging has a vital bearing on your choice of standard welding fittings. It means there is nothing to be desired in welding fittings that is not within the scope of the methods and facilities that have grown out of this experience.

By applying these methods and facilities we have given WeldELLS features that are not combined in any other fittings. A good example of this is the uniform strength achieved through proper distribution of extra metal where stresses are higher. Another, is the extreme dimensional accuracy attained by special truing operations. Still another is the special process which forms the tangents, and there are many more.

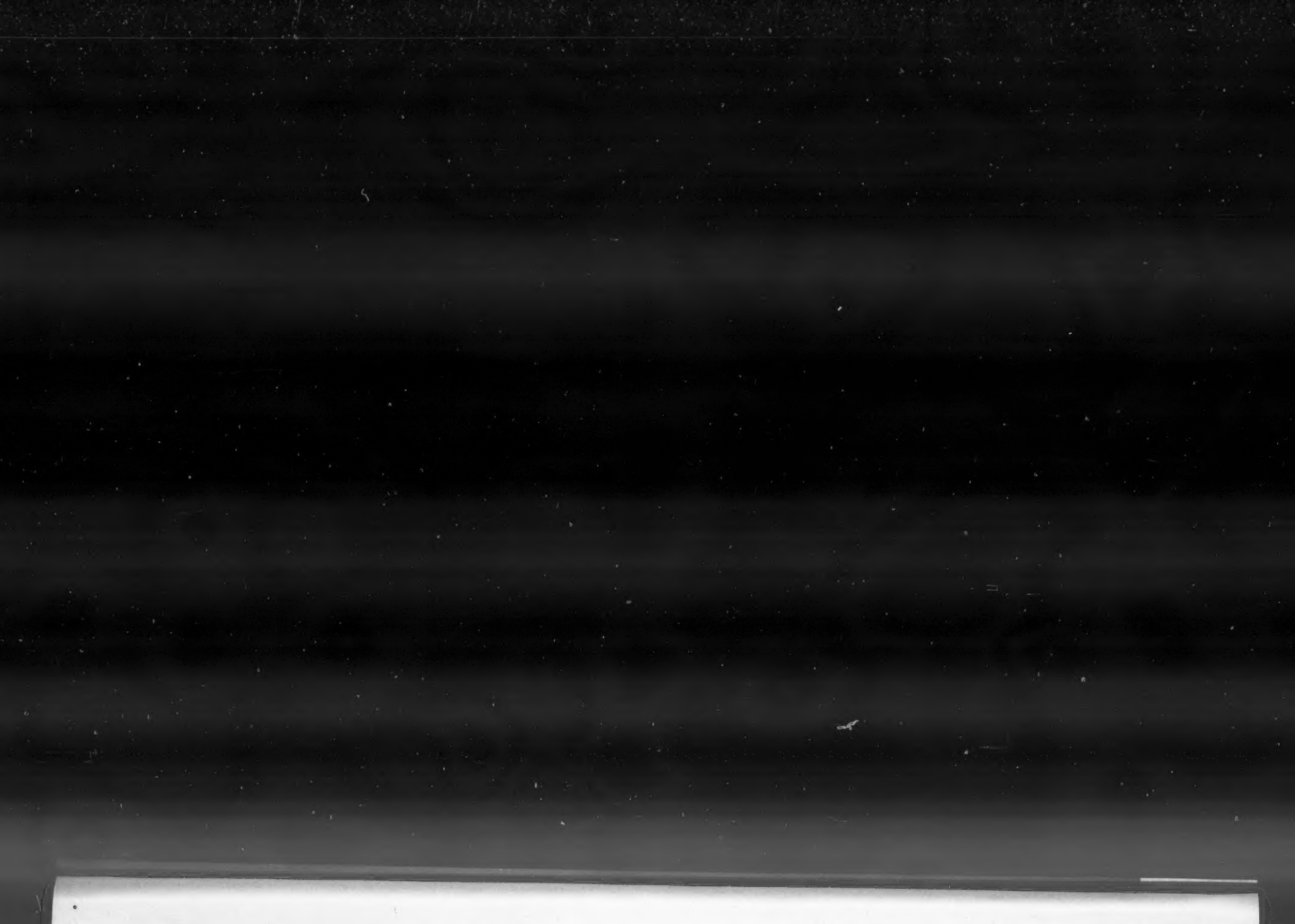
This specialized Taylor Forge knowledge is responsible for the features listed opposite—is the reason why those who are best qualified to know will agree that

## WeldELLS alone combine these features:

- **Seamless** — greater strength and uniformity.
- **Tangents**—keep weld away from zone of highest stress—simplify lining up.
- **Precision quarter-marked ends**—simplify layout and help insure accuracy.
- **Selective reinforcement** — provides uniform strength.
- **Permanent and complete identification marking**—saves time and eliminates errors in shop and field.
- **Wall thickness never less than specification minimum**—assures full strength and long life.
- **Machine tool beveled ends**—provides best welding surface and accurate bevel and land.
- **The most complete line of Welding Fittings and Forged Steel Flanges in the World** — insures complete service and undivided responsibility.

# WeldELLS have everything

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P.O. Box 485
New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.



EM
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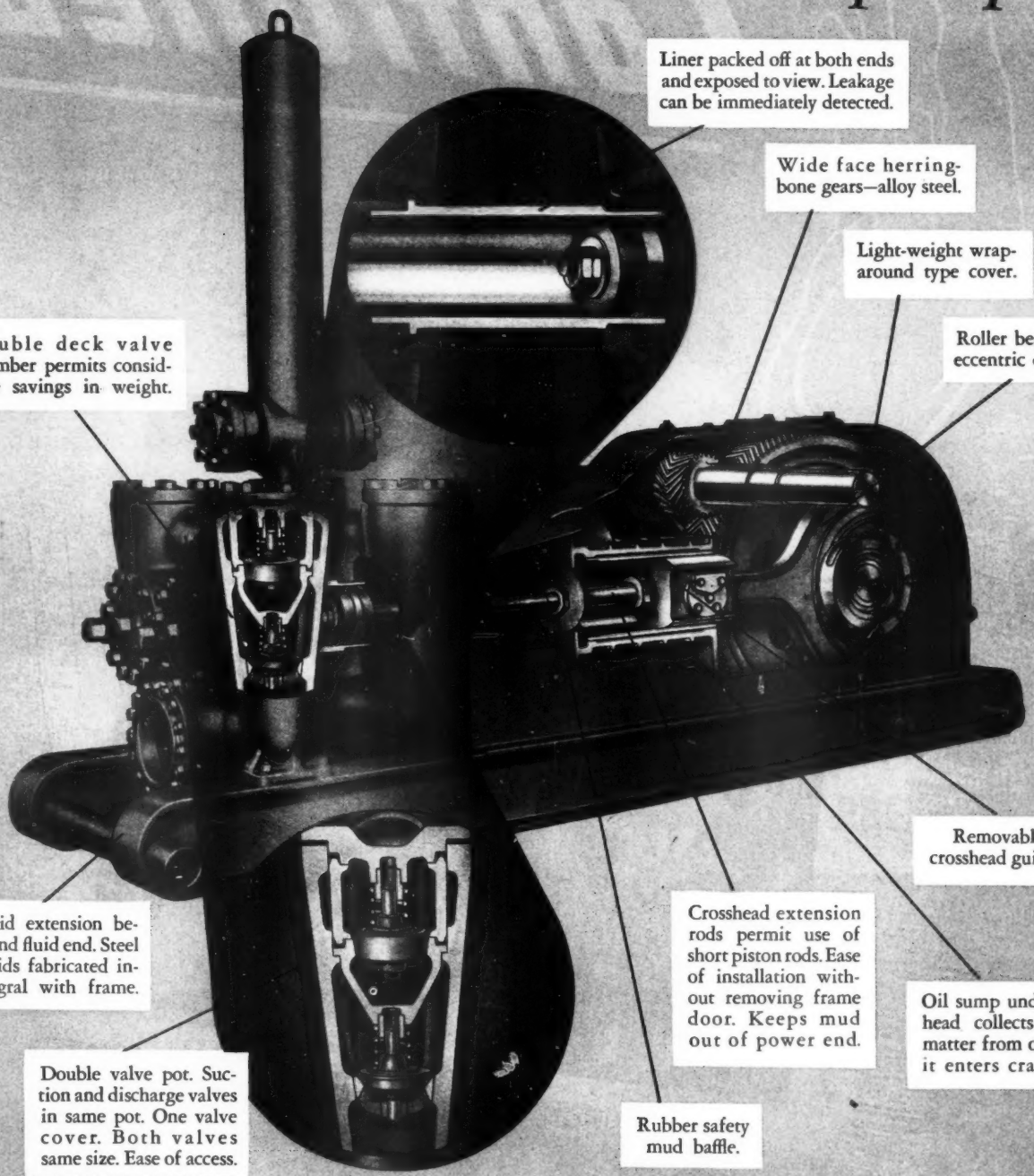
# *There's more than meets the eye in an* **EMSCO** *slush pump*



Liner packed off at both ends and exposed to view. Leakage can be immediately detected.

Wide face herring-bone gears—alloy steel.

Light-weight wrap-around type cover.

Roller bearing eccentric drive.

Double deck valve chamber permits considable savings in weight.

Removable crosshead guides.

Skid extension beyond fluid end. Steel skids fabricated integral with frame.

Crosshead extension rods permit use of short piston rods. Ease of installation without removing frame door. Keeps mud out of power end.

Oil sump under crosshead collects foreign matter from oil before it enters crank case.

Double valve pot. Suction and discharge valves in same pot. One valve cover. Both valves same size. Ease of access.

Rubber safety mud baffle.

**EMSCO DERRICK & EQUIPMENT COMPANY**

Houston, Texas LOS ANGELES, CALIFORNIA Dallas, Texas

"PACEMAKERS IN OILFIELD EQUIPMENT DESIGN"

EMSCO

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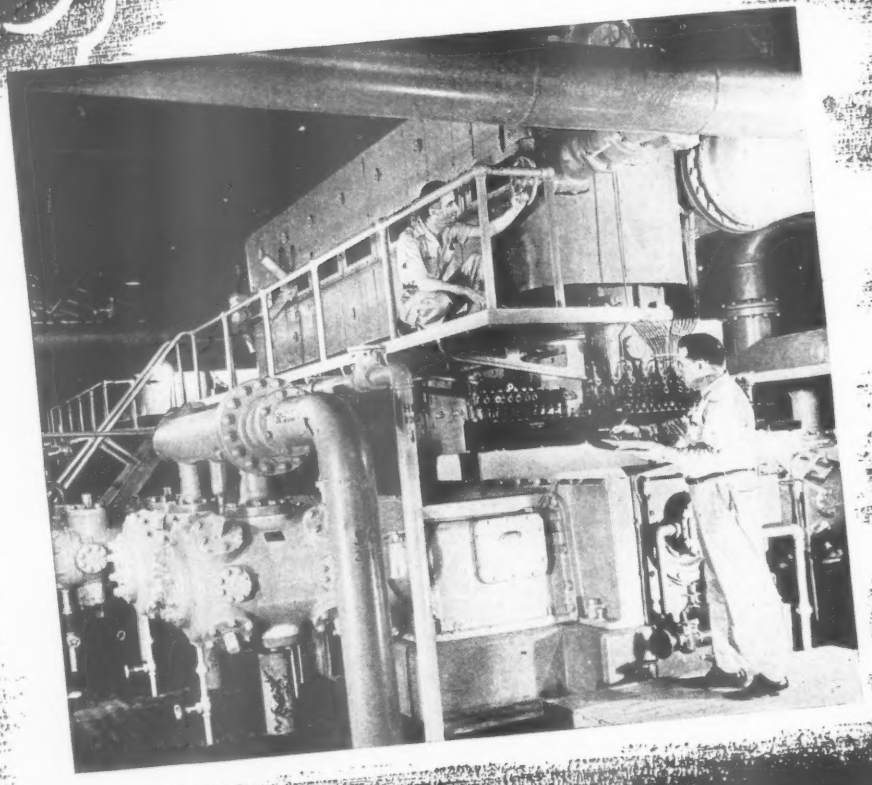
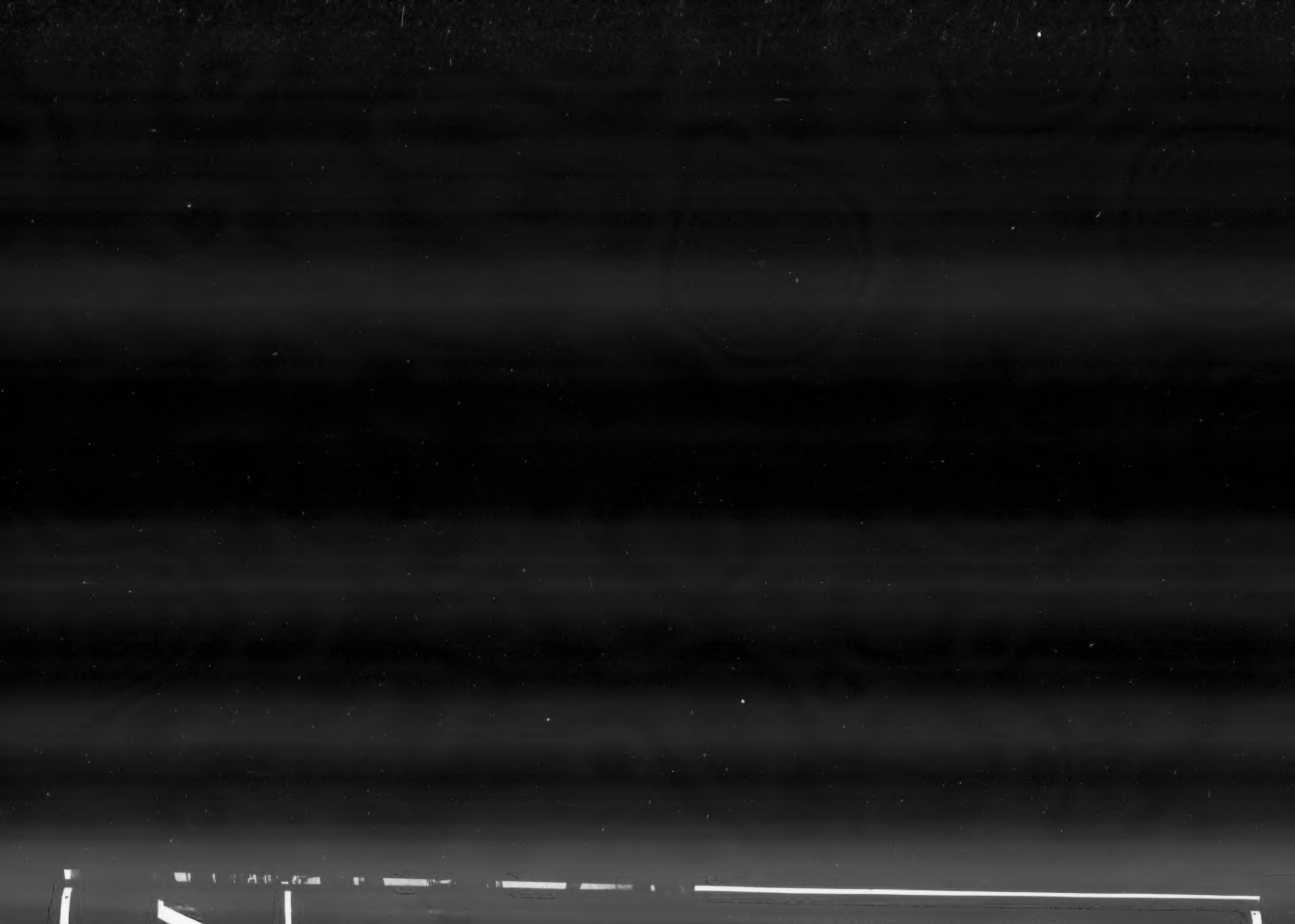
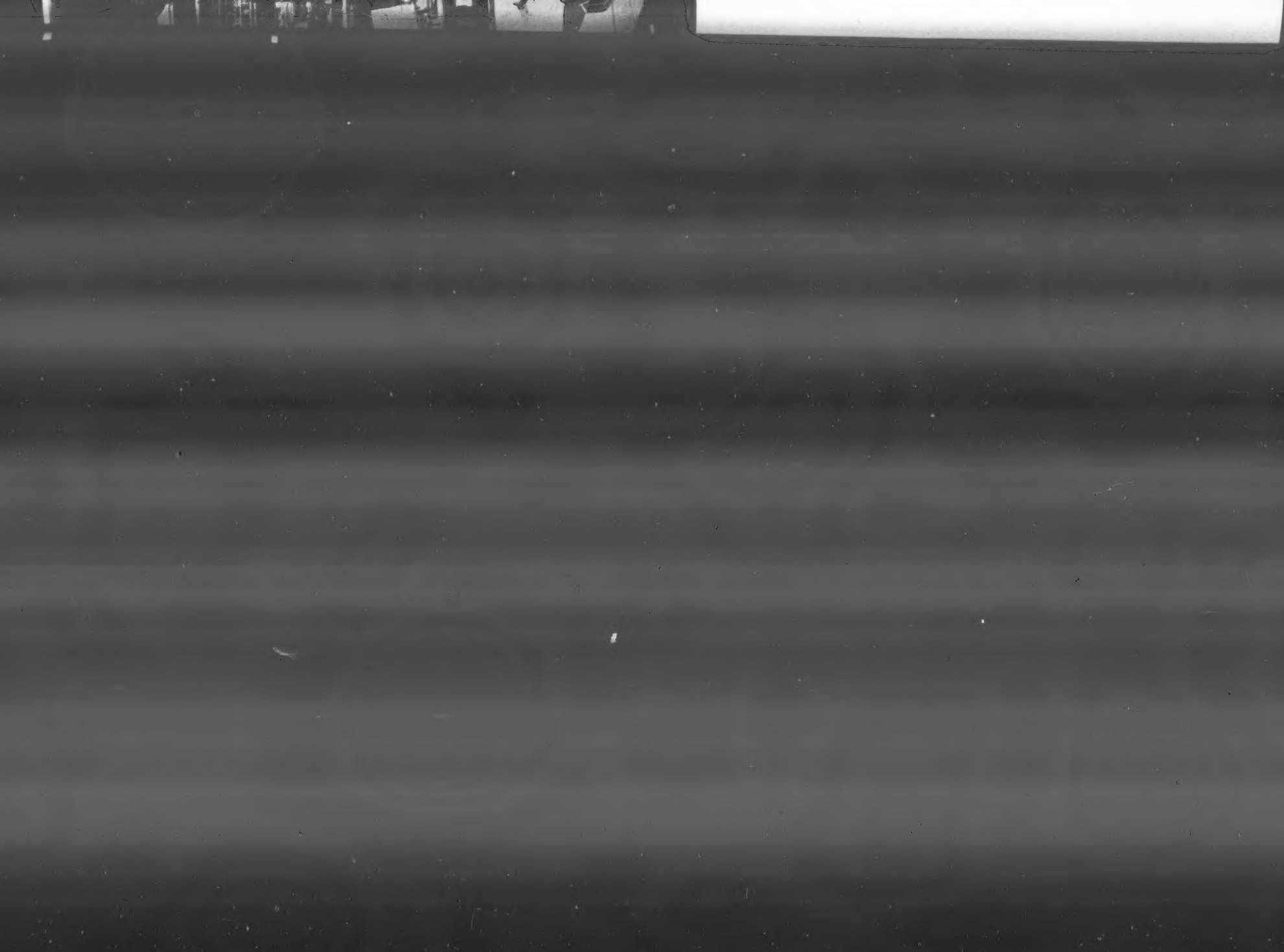
# Controlled



CLARK

STEAM-ENGINE-DRIVEN
"ANGLE" COMPRESSORS





# MATHIESON ALKALI MAKES SYNTHETIC AMMONIA FROM NATURAL GAS UNDER 5000 LBS. PRESSURE

**The Mathieson Alkali synthetic ammonia plant at Lake Charles, Louisiana, uses ten Clark Steam-Engine-Driven Compressors. Gas composed of hydrogen and nitrogen is compressed from atmospheric to 5000 lbs. pressure and then passed through a catalytic process which converts it into ammonia.**

**This type of compressor unit can be built and installed faster and more economically than other types, an important factor in peacetime as it was in the war emergency.**

***Write, phone or wire for full information.***

**CLARK BROS. CO., INC., OLEAN, N. Y.**

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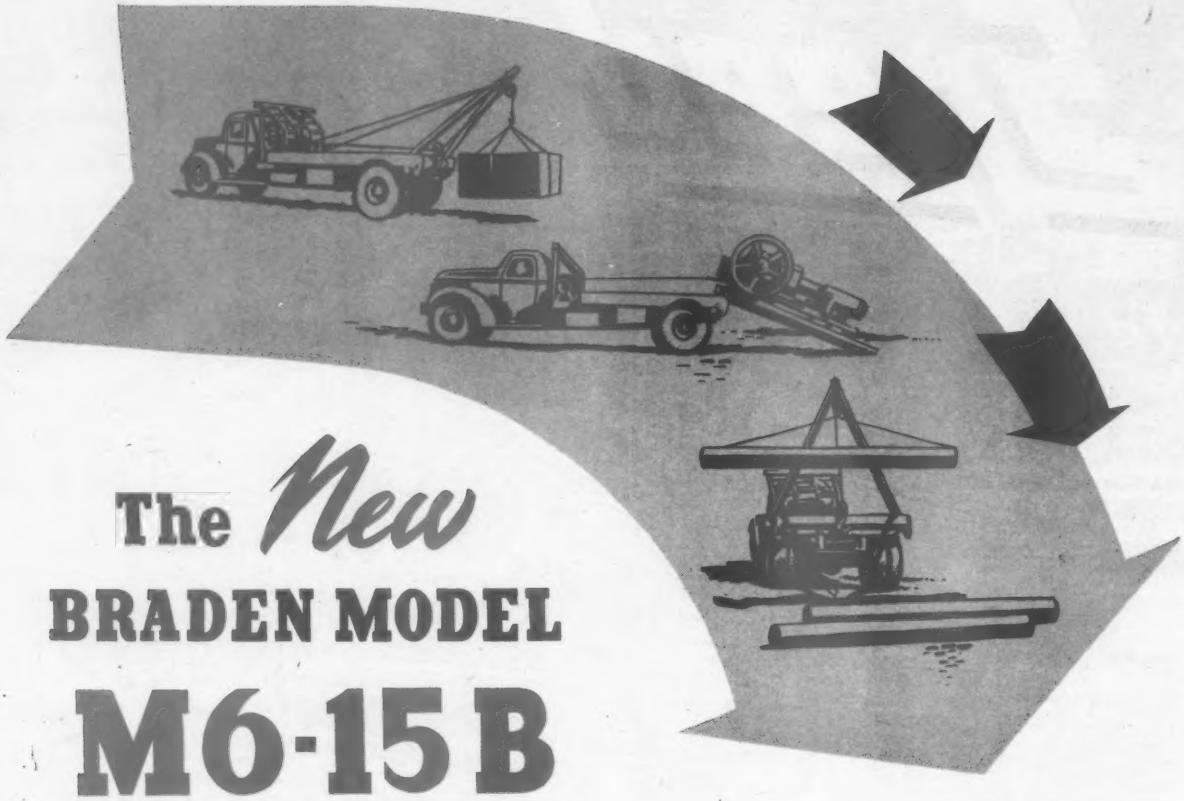
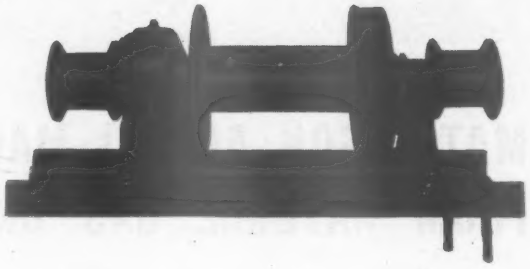


# The *New* BRADEN MODEL M6-15 B

The M6-15B is one of the NEWEST models in the Braden "M" Series line of truck winches. It has already proved to be one of the most versatile truck winches on the market, and is used extensively in the construction, electric and petroleum industries. The M6-15B is equipped with the NEW Oil Cooled, Fully Adjustable, Automatic Safety Brake; and is fully guaranteed. For complete information see your nearest Braden Dealer or write to the factory for catalog.



Safe Working Load 12,000 lbs. For use on 1 and 1½ ton trucks. Furnished with one speed forward and one reverse power take-off, or two speeds forward, one reverse power take-off and all driving and mounting parts.

***BUY BRADEN - They are Safer***

**BRADEN WINCH COMPANY**
1001 East Admiral Boulevard

BRADEN "STANDARD OF THE OIL COUNTRY" *Winches*

**TULSA 3,**
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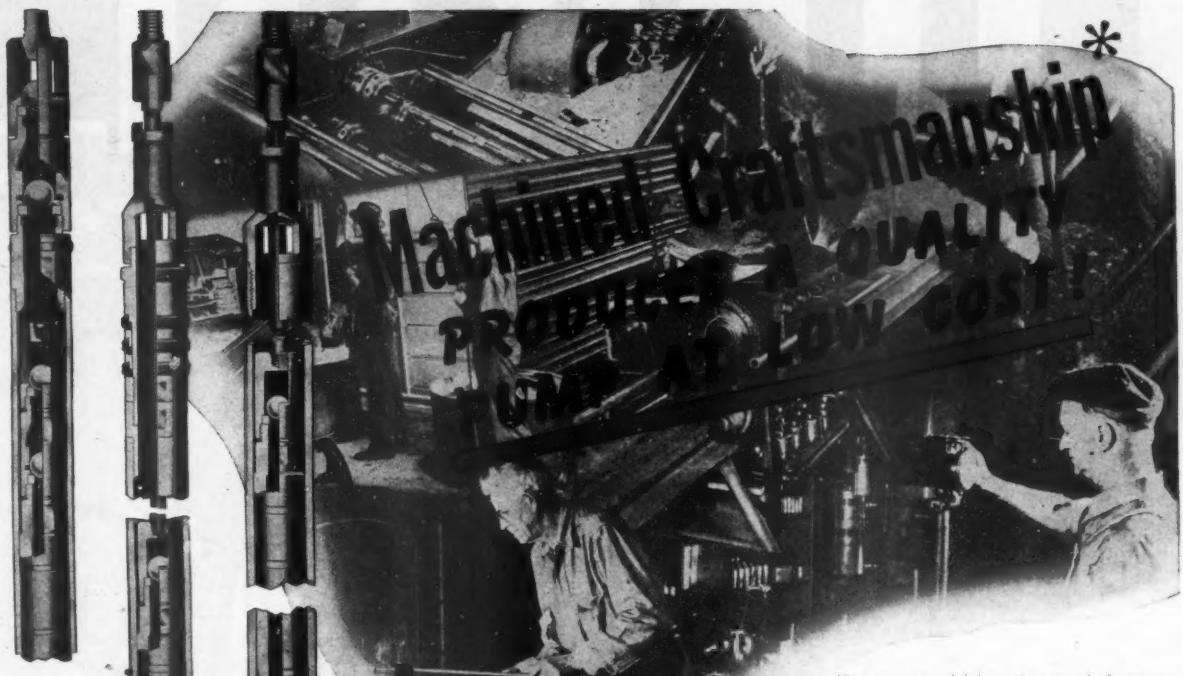
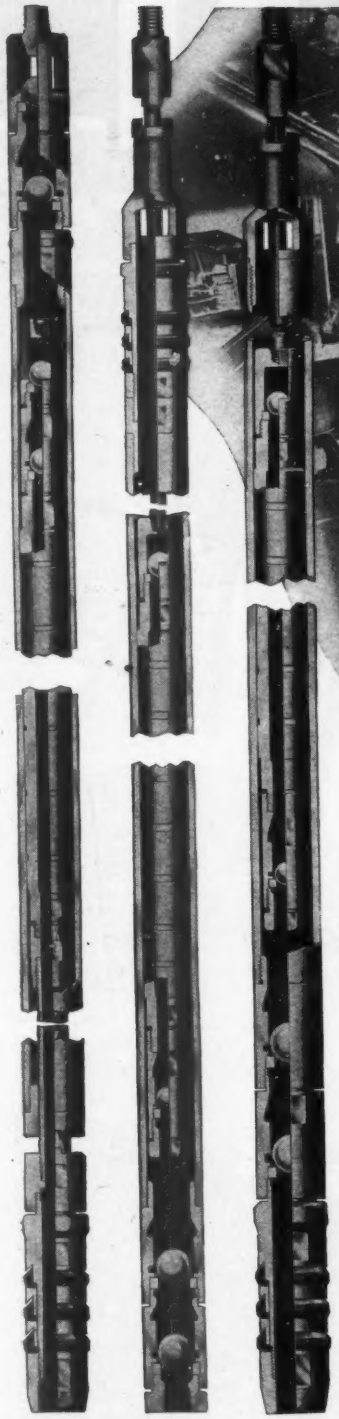



far greater efficiency could be obtained than was being pro[illegible] by any pumps on the market, Fluid Packed Pump Company, a few years ago, set forth to develop new designs and manufacturing methods that would enable them to produce a *high quality* yet *low cost* pump that carried all the features of higher-priced oil well pumps. This far-reaching manufacturing program, which utilized such revolutionary practices as new approaches to metallurgical problems, building special multiple honing machines and perfecting exacting testing and measurement techniques, has resulted in the "Volume Producer," an all-metal, full-barrel insert pump which is providing the oil industry with outstanding performance records.



Travelling Barrel Bottom Anchor | Stationary Barrel Top Anchor | Stationary Barrel Bottom Anchor

### *"VOLUME PRODUCER"* PROVIDES FEATURES FOUND ONLY IN HIGHER-PRICED PUMPS

Check these outstanding features found in "Volume Producers" against your present pump:

- ✓ **One-piece, Alloy Steel Hardened and Honed Barrel Tubes**
- ✓ **Stainless Steel Precision Fitted Seats and Balls**
- ✓ **Reversible One-piece, Pin-both-end, Chrome Plated Grooved Plungers**
- ✓ **Heavy Duty Cages**
- ✓ **Heat-treated Machined Parts**

The "Volume Producer" has the largest possible cross-sectional displacement area and is available in sizes and metals to provide the right pump to efficiently handle your well conditions. Its smooth operation keeps pumping costs down. For low cost, economical maintenance, and qualities inherent only in higher-priced oil well pumps contact your Fluid Packed Pump Company representative and ask about the "Volume Producer" and other Oilmaster Products.

* MACHINED CRAFTSMANSHIP—Years of research, engineering and far-reaching advancements in pump design resulting in complete new manufacturing methods that produce far greater pumping efficiency.

**FLUID PACKED PUMP COMPANY • LOS NIETOS, CALIFORNIA**

OILMASTER PRODUCTS

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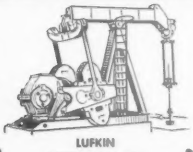
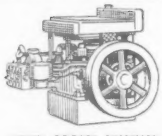
## PUMPING UNITS

A TYPICAL LUFKIN INSTALLATION

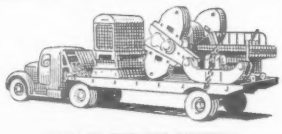
**Lufkin units field tested and proven, will give you years of care-free, trouble-free service—many of the first Lufkin units built are still delivering the goods.**



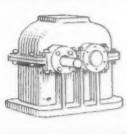
LUFKIN
PUMPING UNITS



LUFKIN-COOPER-BESSEMER
ENGINES



LUFKIN OIL FIELD AND INDUSTRIAL
TRUCK TRAILERS



INDUSTRIAL SPEED REDUCERS
AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY
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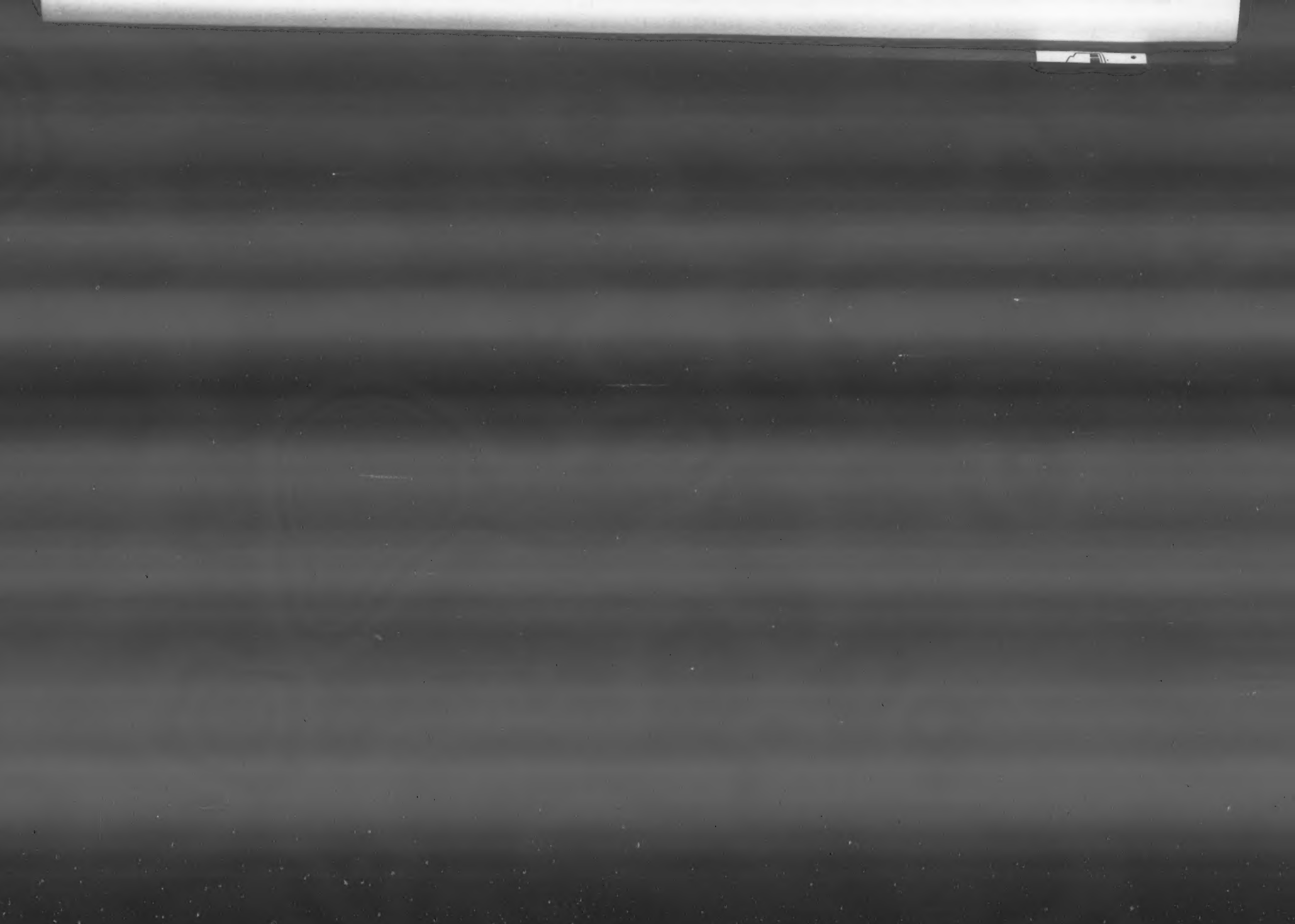
**LUFKIN FOUNDRY & MACHINE COMPANY** LUFKIN TEXAS



# THIS IS WHY MacCLATCHIE

"WEAR-EVER" PUMP PISTONS

•

"MONEY SAVER" PUMP LINERS

•

"AIRFLOTE" MUD PUMP VALVES

•

HARDENED & GROUND PISTON RODS

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SLIDING PLATFORMS, MONKEYBOARDS

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FLOW BEANS

## "MONEY SAVER" LINERS *WEAR LONGER*

Structural uniformity of the material and uniform hardness of the wearing surface are the most important requirements of long wearing liners—you get these features with a MacClatchie "Money Saver" Pump Liner.

"Money Saver" Liners are made of the finest quality alloy seamless tubing run to our specifications in lots of several thousand feet which results in exact structural uniformity of material and makes possible a uniform heat treated wearing surface over the entire length of each liner. This eliminates the possibility of soft sections which cause liners, cast or forged singly, to wear unevenly.

Yes—you will always find that MacClatchie Liners wear longer and are truly a "Money Saver." Uniform quality is the principal reason more MacClatchie liners are in use today than any others!

**MacClatchie "Money Saver" Liners are made in over 756 different sizes and designs. Order yours today—sold by leading supply stores everywhere.**

## MacCLATCHIE MANUFACTURING COMPANY

**COMPTON, CALIFORNIA**

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***Alberta, Canada:*** **GEORGE KIPP, LTD., Calgary**

***Rocky Mountain District:*** **MacCLATCHIE MFG. CO., Casper, Wyoming**

***Export:*** **ELMER R. SMITH, 617 So. Olive St., Los Angeles 14, Calif.**

# perforated perfection TIMES 753

Like much other process equipment, this huge tube sheet is simple in appearance—yet it posed many complex problems in the fabrication of the butadiene converter of which it is a part.

Design and stress distribution factors were complicated because of the widely fluctuating temperatures in which the vessel was required to operate, and because of its large number of tubes—753.

Yet the accurate spacing and uniform drilling of so many holes in tube sheets of this size do not tell the whole story of B&W versatility in building this and other pressure vessels. For example, all joints in the shell of this converter were made by the B&W Fusion Welding Process, which includes automatic welding, X-ray inspection and stress relieving. Welds produced by this method equal or exceed the plate metal in tensile strength, ductility, impact resistance, grain structure, and ability to withstand repeated stresses.

Many years of fabricating all types of high-pressure vessels, condenser shells, autoclaves, separators, fractioning columns, bubble towers, etc., have built up a fund of experience at B&W. This knowledge, plus trained personnel, extensive laboratory, and modern production facilities — all are at your service.

Write, phone or wire if you think we can help you now.

Pressure vessels under construction at a Babcock & Wilcox plant.

Butadiene converter built by B&W for operating temperatures fluctuating between 750F and 1200F, at 135 psi.

B&W

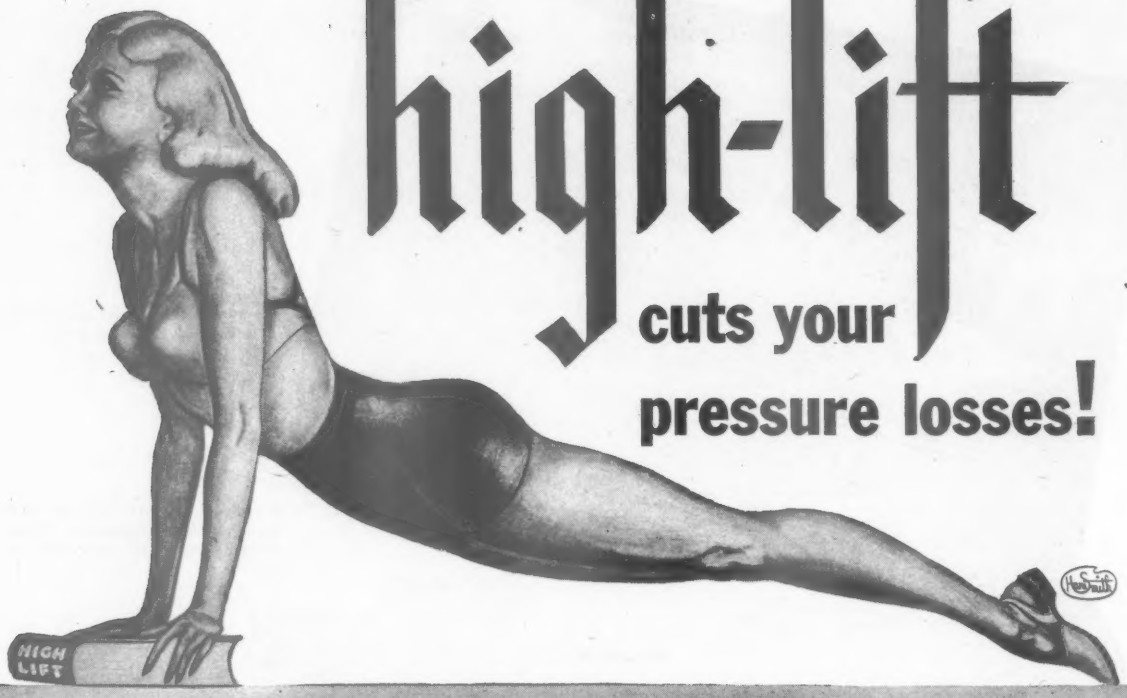
Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

**BABCOCK & WILCOX**

THE BABCOCK & WILCOX CO.

85 LIBERTY STREET, NEW YORK 6, N.Y.

# high-lift cuts your pressure losses!



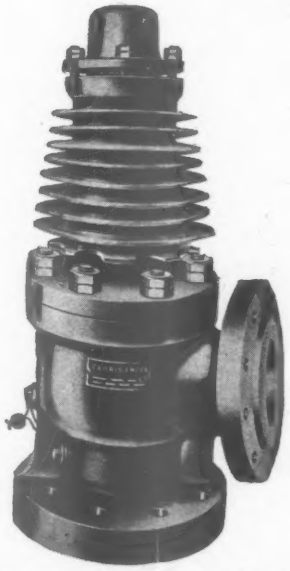

Specify FARRIS "high-lift" valves for non-shock relief of over-pressures. You're done with slow sputtering pop actions . . . costly losses of working pressure . . . when you specify FARRIS! The high-lift action of the FARRIS relief valve-design delivers high-capacity discharge — for quick relief of over-pressure.

*How does FARRIS get this high-lift action? 4 ways:*

1. *The unique disc-design gains extra lift from the high-velocity port discharge.*
2. *Single blowdown ring does not affect capacity.*
3. *The long, low-stressed springs are custom-rated.*
4. *Friction lag is held to a minimum by centralized guiding of the springs and precision alignment.*

**The new FARRIS Catalog tells you which "high-lift" valve you need to lower excessive pressure-losses in your pressure lines — *to lift your operating efficiency!***

**Write today for new FARRIS catalog!**



*FARRIS high-lift Venturi Port. Type 1650, high-pressure, high-temperature Safety Relief Valve. Sizes 1½" to 4", pressures up to 900 lbs. — 1000°F.*

Farris **SAFETY AND RELIEF VALVES**

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372 Commercial Ave., Palisades Park, N. J. PE-521

*FARRIS keeps pace with advancing power and process engineering*

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## NEW tools that solve an OLD problem

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Type B-122

**HERE are paraffin tools that will keep your wells producing.** Offered for sale only after long field tests, models are available for all producing conditions.

Included is Type B-122, designed for automatic operation in flowing wells. Any well with pressure enough to flow can be kept free of paraffin with this tool.

Type H-130 is designed with revolving cutters which scrape the entire inner surface of the tubing.

For Kobe pump units, an especially designed scraper attaches to the macaroni string and prevents deposition in the annulus between inner and outer tubing strings.

Other models available for flowing, pumping and gas lift wells. For latest information on paraffin control, write for literature describing these modern S-I-W tools.

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*Manufacturers of Oil Field Specialties*

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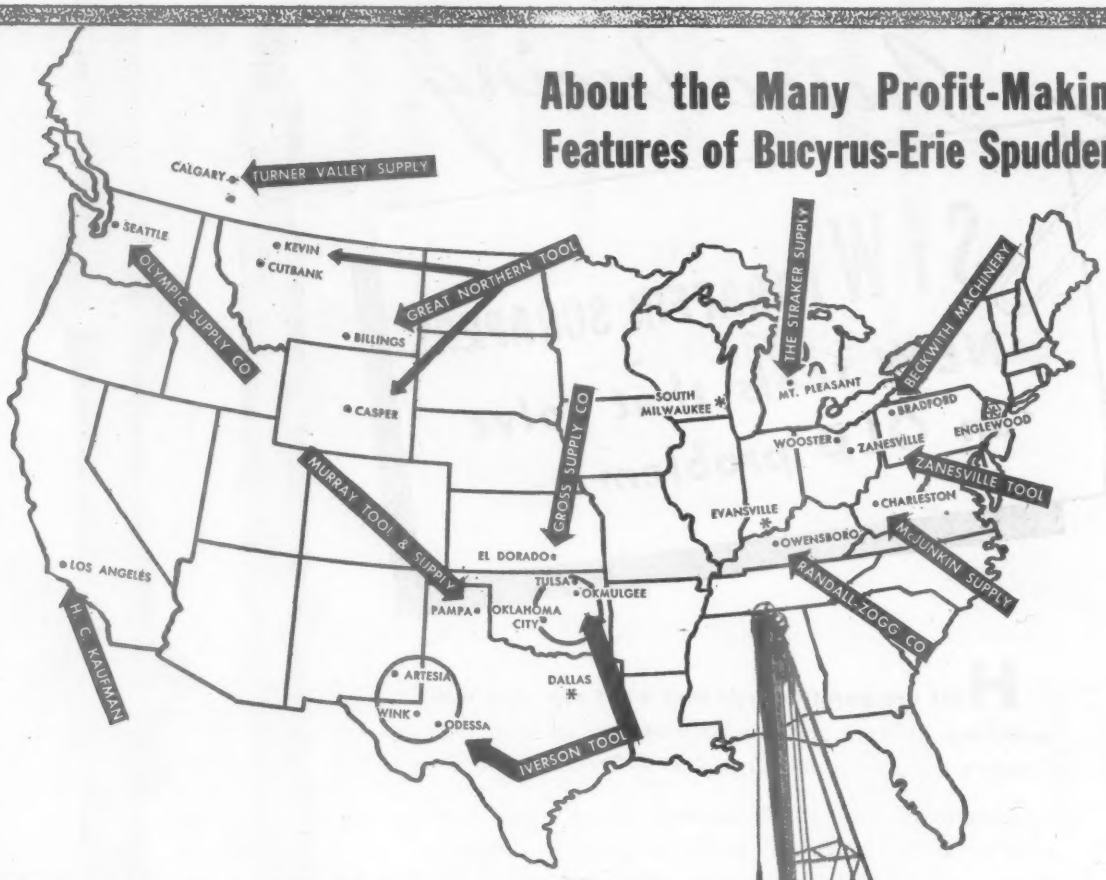


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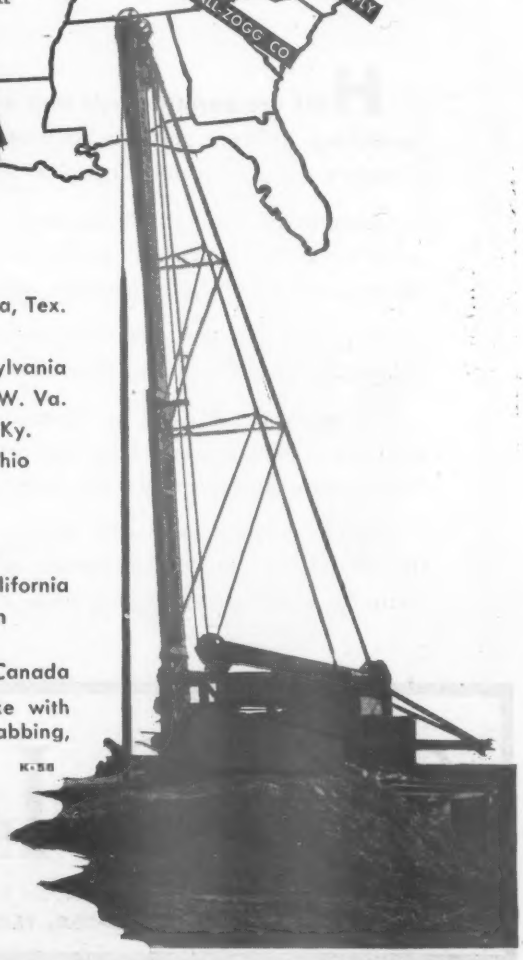
Check now with your distributor on the savings you can make with Bucyrus-Erie spudders on your drilling, tailing-in, clean out, swabbing, fishing, and servicing jobs.

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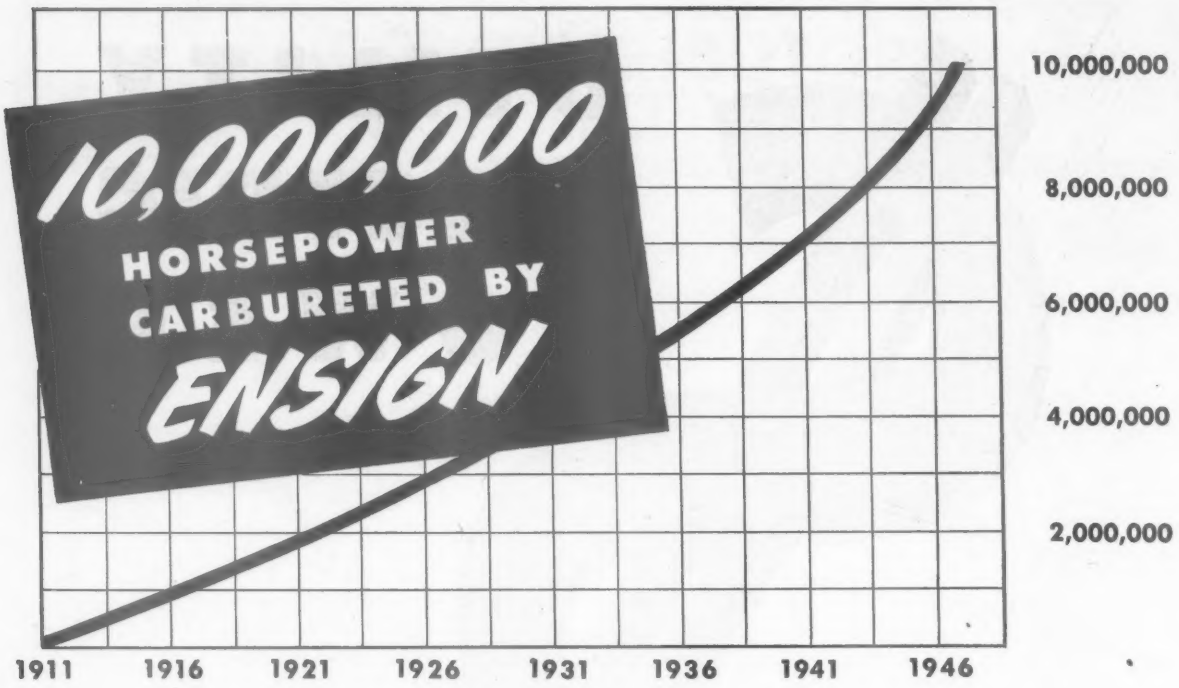


A recent survey reveals that carburetors for more than 10 million horsepower have been built by ENSIGN since 1911 . . . This gradual, healthy growth is a direct result of two basic factors—RELIABLE CARBURETOR PERFORMANCE and RIGID QUALITY CONTROL.

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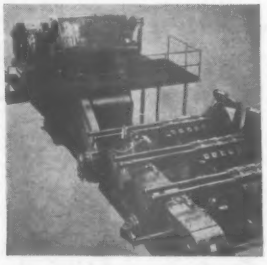
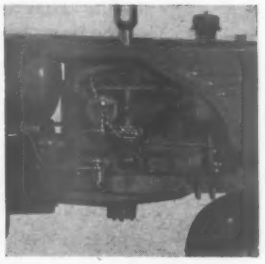
Accurate, rigid QUALITY CONTROL also is of extreme importance to ENSIGN users. Examine any ENSIGN product anytime—good, sturdy, serviceable—the quality is there. Rigorous inspection of materials and processes PLUS sound engineering design results in a dependable and uniform product.

Your selection of ENSIGN products brings you the efficiency and economy that has been developed through carburetion of over 10,000,000 horsepower.

**PUMPING • DRILLING • TRANSPORTATION • FARMING**





*Write us for complete information. Our competent engineering staff is at your service.*

**ENSIGN CARBURETOR COMPANY**

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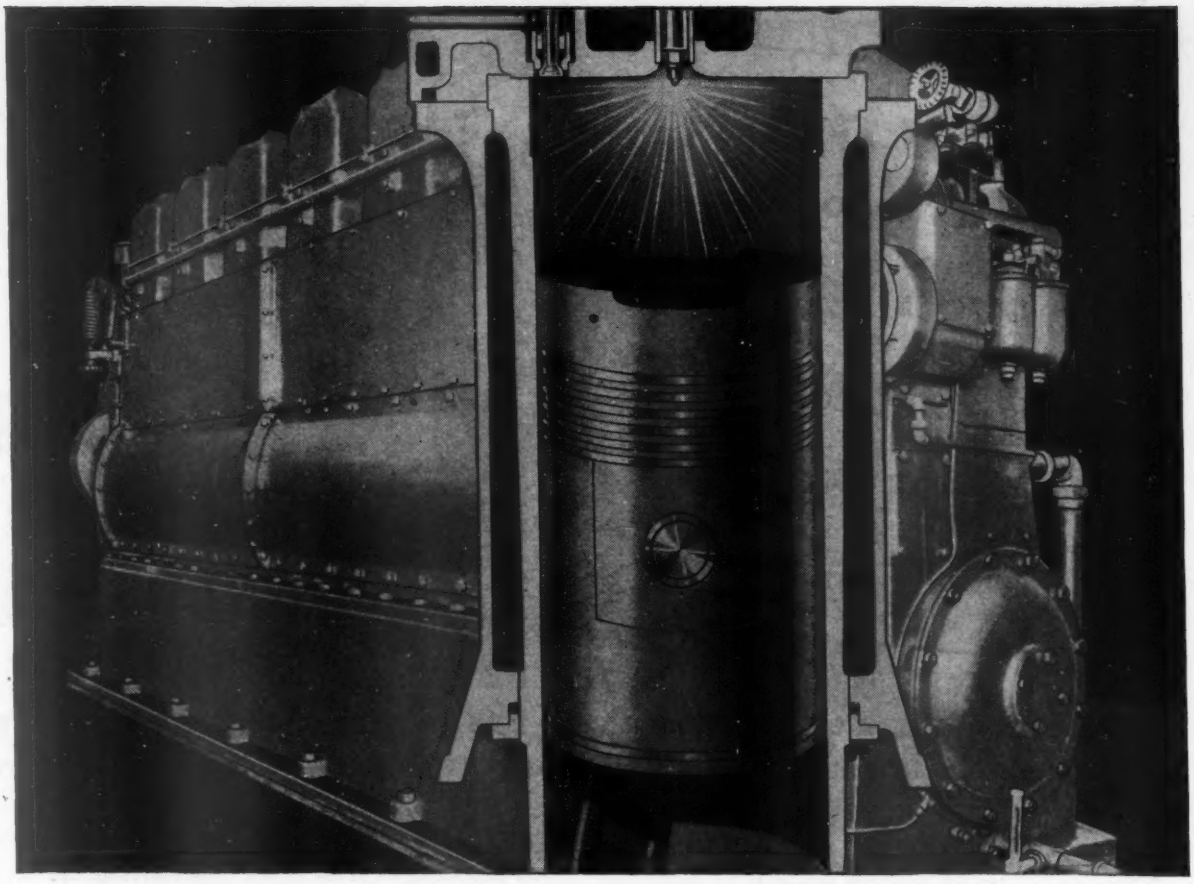
*"PIONEERS IN EFFICIENT CARBURETION" • ESTABLISHED 1911*



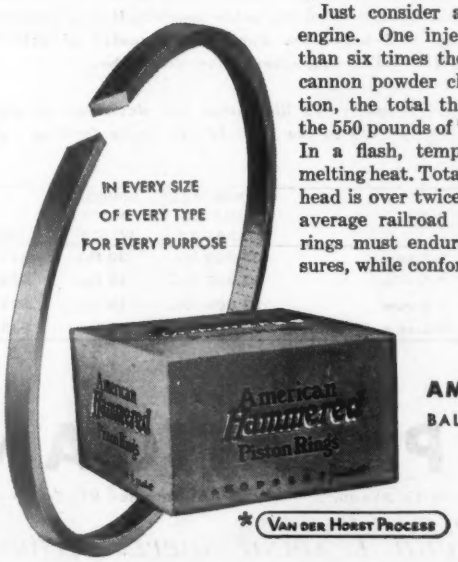
# Harnessing 6 "Cannon-power" demands something special in rings!

Ever stop to think what happens in a Diesel cylinder when it fires?

Just consider a single cylinder in a large engine. One injection of fuel contains more than six times the thermal energy of a 20mm cannon powder charge. (In 35 minutes operation, the total thermal energy equals that in the 550 pounds of TNT in a 1000-pound bomb.) In a flash, temperatures zoom above steel-melting heat. Total pressure against the cylinder head is over twice as great as the weight of an average railroad locomotive. And the piston rings must endure this heat, seal these pressures, while conforming to the varying face and diameter of a cylinder wall!

That's why—at American Hammered—everyone makes it his business to make ever better rings . . . why our ring research laboratory constantly prospects for new alloys and triple-checks all current production . . . why our chrome-plating department is multiplying ring life through the magic of PORUS-KROME* . . . why our engineers are always ready to diagnose your ring needs, and prescribe from our 30,000 types and sizes, the set-up that mates with your individual job.

Let us give you rings that will give you better Diesel performance.




**KOPPERS COMPANY, INC.**

**AMERICAN HAMMERED PISTON RING DIVISION**
BALTIMORE 3, MARYLAND

**KOPPERS**

THE INDUSTRY THAT SERVES ALL INDUSTRY

# RATIGAN

## NO. 204 & NO. 205

## *open type*

## POLISH ROD GRIPS

**DESIGNED TO ACCOMMODATE PRESENT TYPES OF UNITIZED PUMPING EQUIPMENT WHICH REQUIRE A SHORT AND NARROW GRIPPING DEVICE OF HIGH CAPACITY**

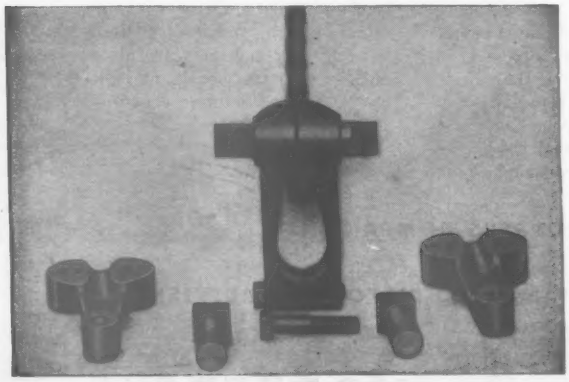
*Smaller and Lighter in Weight, Yet Have 30% Greater Holding Capacity*

Ratigan No. 204 and No. 205 Polish Rod Grips are identical in capacity and mechanism with the exception of trunnions which have been added to the latter. Both types consist of three parts—the body, the connecting block, and the gate.

The No. 204 Grip will accommodate most of the pumping units having carrier bars, usually supplied by the manufacturer. Its height is less than that of our popular No. 7 screw type grip, and the body is approximately half the width, while the weight is considerably less. A comparison of this grip with two of our former major screw type grips in the table below.

The No. 205 Grip is a combination Carrier Bar and Grip, and will accommodate centers from 8" to 10". The trunnions on this grip should be at the bottom when operating, and allow more flexibility of the wire line between the trunnions and the bottom of the horsehead, and will prolong the life of the cable.

Due to the short distance between the horsehead and the stuffing box on present types of pumping units, we recommend using the No. 205 Grip with Ratigan No. 181 Wire Line Clamps, shown below; these clamps being adapted to the trunnions, as well as being used extensively on all types of wire line horseheads. This clamp being short, the operator obtains the benefit of all the cable possible. It also eliminates babbitting, and keeps the lines in the center of both the grip and the polish rod, where they should be.



*Ratigan No. 181 Screw Type Wire Line Clamp*

*All Ratigan products are illustrated and described on pages 2507 to 2526 of the 1943-44 Composite Catalog*

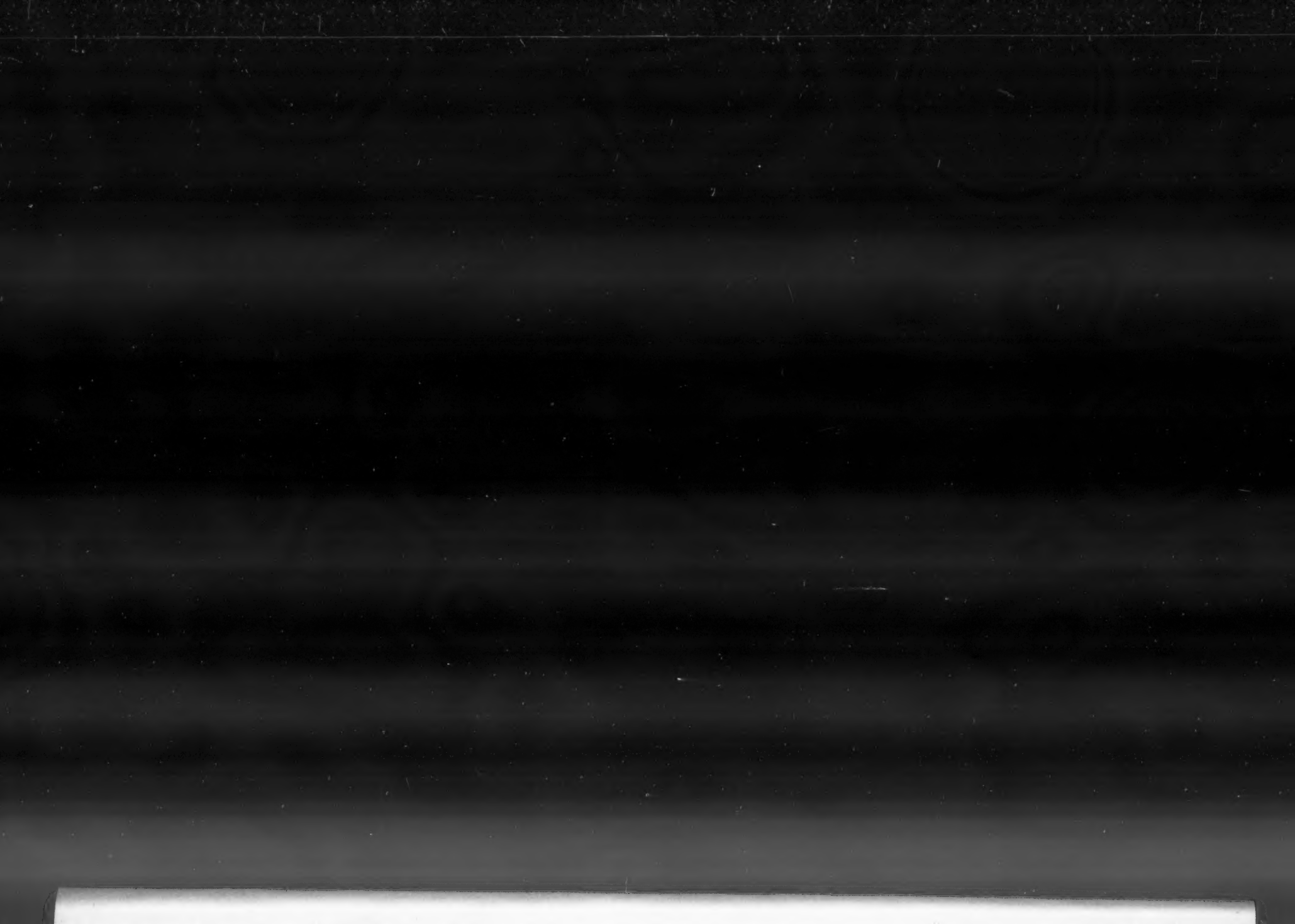
| TYPE | | APPROXIMATE HOLDING CAPACITY | APPROXIMATE WEIGHT | PRICE |
|---|---|---|---|---|
| No. 7 | 2-Screw | 37,000 lbs. | 30 lbs. | $25.00 |
| No. 50 | 3-Screw | 53,000 lbs. | 45 lbs. | $35.00 |
| No. 204 | 2-Screw | 53,000 lbs. | 19 lbs. | $25.00 |
| No. 205 | 2-Screw (Trunnion) | 53,000 lbs. | 28 lbs. | $35.00 |

*Manufactured by*

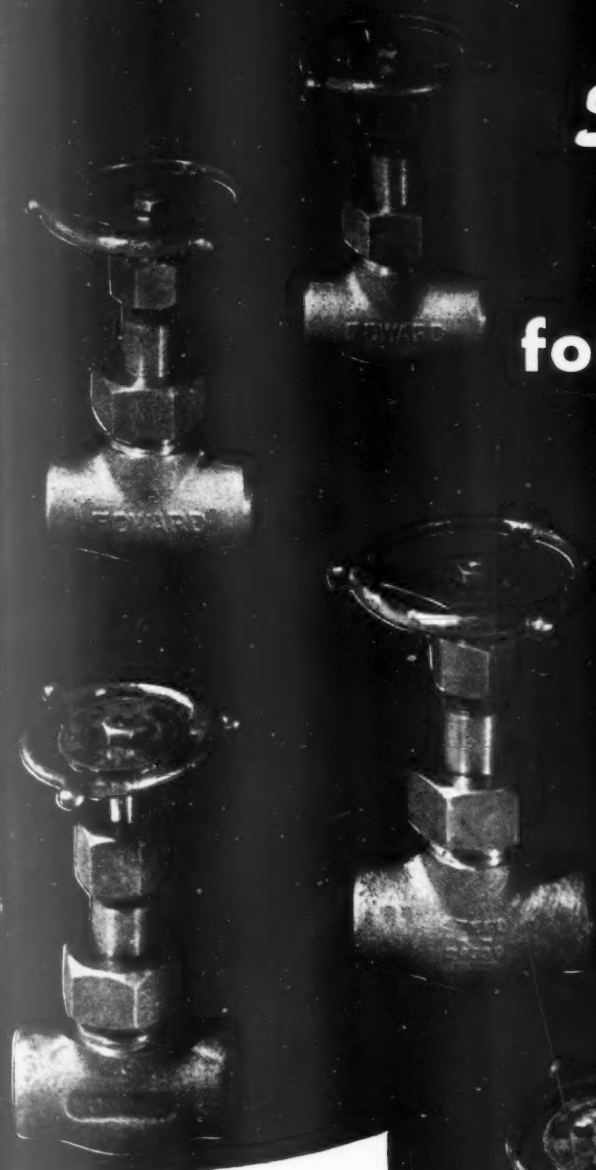
# J. P. RATIGAN

1213 Santa Fe Avenue — Los Angeles 21, California

*RATIGAN PRODUCTS ARE DISTRIBUTED THROUGH LEADING SUPPLY STORES*



# *Straight-through*
# FLOW
## for small pipe lines



For small lines where straight-through flow is required, here is an ideal valve. Especially suitable for sampling, viscous fluid and instrument line service.

Body and bonnet are forged steel and the disk is a truncated cone swivel plug, giving full contact against a borized conical seating surface. A diagonal pressure relieving hole is drilled below the disk to facilitate seating or unseating. It may also be used to open a passageway for cleaning out the valve.

Three styles are available

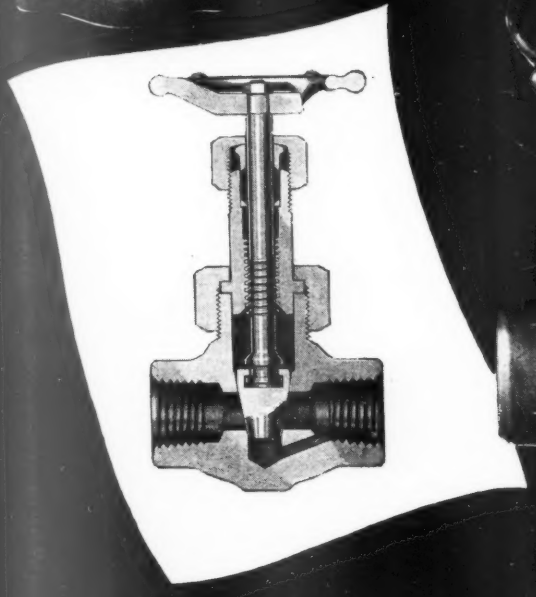
Fig. 150—Carbon steel body and bonnet, stainless steel trim.

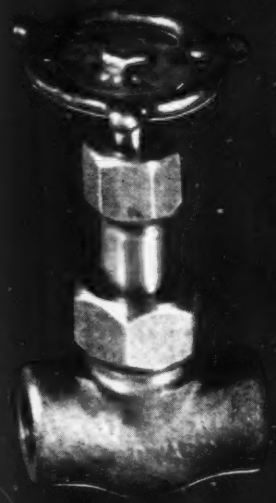
Fig. 2150—All stainless steel.

Fig. 4150—All "18-8" steel.

Built in ⅛ in. to 1 in. sizes inclusive.

Write for Catalog No. 103.





# *Edward Valves, Inc.*

*Subsidiary of Rockwell Manufacturing Co.*

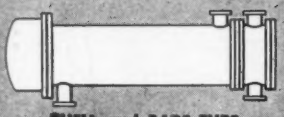
EAST CHICAGO, INDIANA

POURING
GOOD MACHINEABILITY
INTO EVERY HEAT OF
TESCO
Quality
STEEL
Good machineability means Tesco Quality Steel Castings can be machined more economically. It means freedom from hard spots . . . easier machining . . . with faster machine speeds. It means a saving of valuable shop time to machine Tesco Quality Steel Castings. Good machineability is characteristic of every Tesco Quality Steel Casting. Look for the Tesco Hallmark. It's recognized as a safety signal on steel castings throughout the oil industry.
Symbol of Quality wherever men drill for oil
TEXAS ELECTRIC STEEL CASTING CO.
GOOD CASTINGS
TESCO
HOUSTON, TEXAS

# 50 USES...

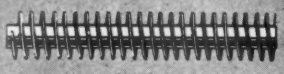
Absorption Oil Cooler
Acid Cooler
Acid Sludge Heater
Air Aftercooler
Air Heater
Alcohol Cooler
Alcohol Naphtha Preheater
Bleeder Heater
Boiler Blowdown Exchanger
Butane Cooler
Caustic Solution Cooler
Condensate Cooler
Cracked Residuum to Naphtha Charge Exchanger
Crude Preheater
Depropanizer Bottoms Cooler and Exchanger
Diethylene Glycol Exchanger
Ethyl Alcohol and Water Heater
Evaporator Blowdown Exchanger
Feed Preheater
Feed to Product Exchanger
Fractionary Bottoms Cooler
Fuel Oil Heater
Fuel Oil to Cycle Gas Exchanger
Gas Oil Cooler
Gasoline Cooler
Gasoline Heater
Gasoline to Cold Oil Exchanger
Heptane Cooler
Inlet Gas Cooler
Jacket Water Cooler
Kerosene Cooler
Lime Kiln Heater
Natural Gas Cooler
Nitro-benzene Heater
Nitrogen Cooler
Propane Cooler
Propane Evaporator
Propane Vaporizer
Quenching Oil Cooler
Rotary Furnace Oil Cooler
Shellac Solution Cooler
Solution Cooler
Stabilizer Exchanger
Stabilizer Naphtha Cooler
Still Heater
Stripping Tower Bottoms Cooler
Tar Residue Heater
Vapor Heat Exchanger
Water to Water Exchanger
Wax Plant Subcooler

## ONLY G-R BUILDS THIS WIDE VARIETY OF HEAT TRANSFER APPARATUS

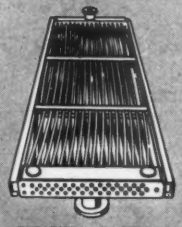


**SHELL and BARE TUBE**
Heaters, Coolers, Condensers, Heat Exchangers

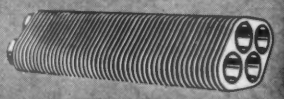
**G-FIN**
Longitudinal-finned elements for greater heat conductivity



**K-FIN**
Helical-finned elements for vapors and gases



**BENTUBE SECTIONS**
with scale-shedding elements for hard or salt water



**TUBEFLO SECTIONS**
Non-clogging design for residuum and other dirty fluids

# EVIDENCE OF TWIN G-FIN SECTION *VERSATILITY*

The remarkable versatility of the Twin G-Fin Section is indicated by its many installations for each of the services in the accompanying tabulation . . . and other applications as well.

Even more significant of Twin G-Fin Section versatility is the fact that in many instances these standard, interchangeable units have been transferred from one duty to another.

More than 40,000 installed sections, some of which have been in service for well over 10 years, have conclusively proven the excellence of design and construction of these units. The wealth of performance data resulting from this unequalled experience in building fin-type heat exchangers is your assurance of authoritative recommendations and satisfactory service.

*Write for Bulletin 1614 describing these units in detail.*

**THE GRISCOM-RUSSELL CO.**
285 Madison Ave. New York 17, N. Y.

GR-106

# GRISCOM-RUSSELL

*Pioneers in Heat Transfer Apparatus*

*"Maybe Solar can make it of stainless!"*

Does *your* problem involve the use of corrosion or heat resistant metals?

Yes? Then the specialized skills and equipment of Solar can be valuable factors in its solution.

☆ Since 1930, Solar has concentrated on the design and fabrication of intricate shapes from stainless steel and other high temperature alloys. It has developed techniques in forming and rare skill in welding its products. Solar's engineers and craftsmen are accustomed to maintaining high standards of quality and to work to close tolerances. An inquiry will place their skills at your service.

*Let* **SOLAR** *solve it!*

SAN DIEGO 12, CALIFORNIA ☆ DES MOINES 5, IOWA

# *There's Money "Here" For Oil "Anywhere"*

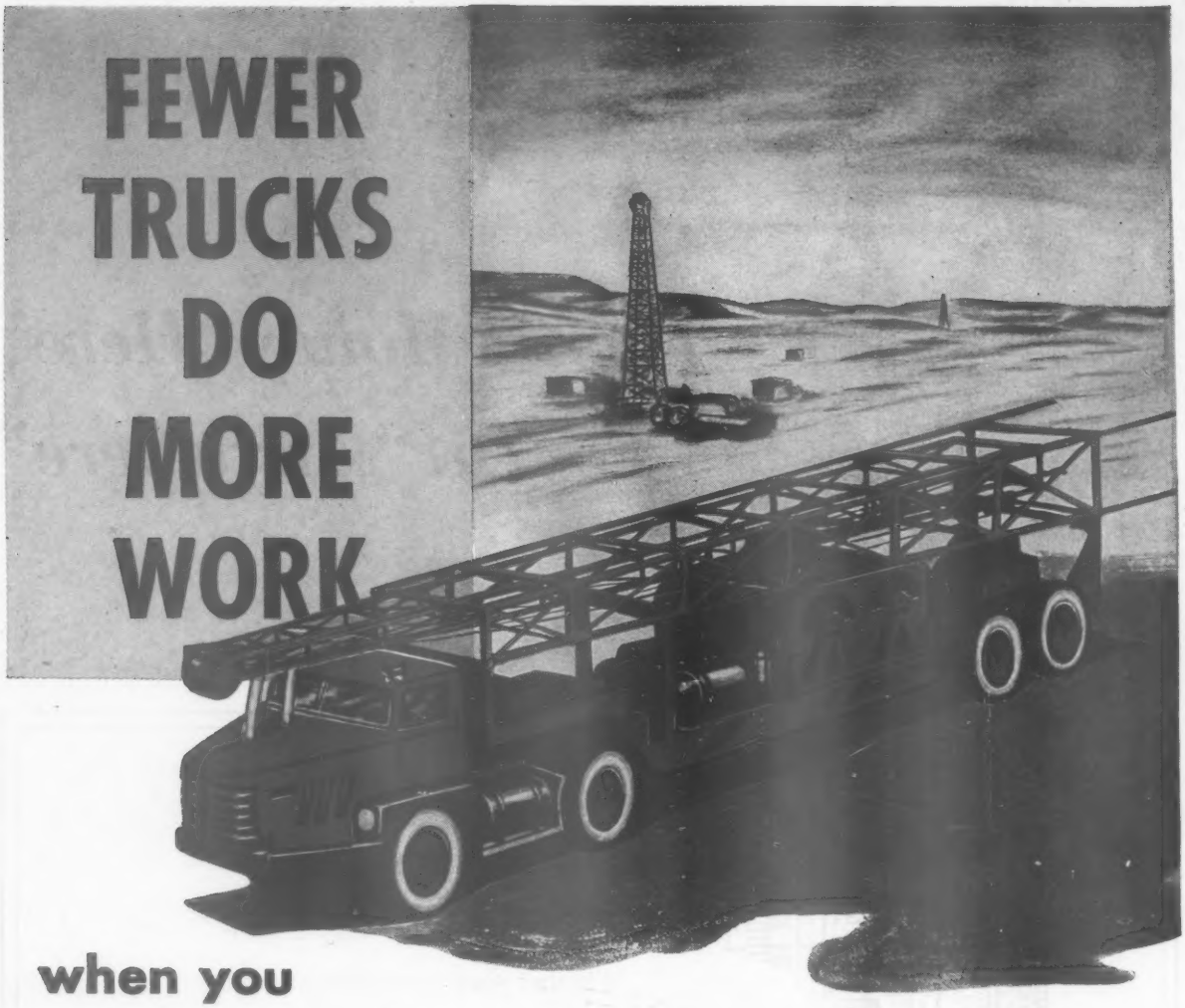
Whether your operations are in the Mid-Continent, the Gulf Coast, Michigan, Illinois or Colorado . . . this bank is interested in taking care of your financial requirements on all sound oil propositions. You'll find it to your interest to discuss your financial needs with *The Oil Bank of America.*

## NATIONAL BANK OF TULSA

*The Oil Bank of America*

*Member Federal Deposit Insurance Corporation*

# FEWER TRUCKS DO MORE WORK



## when you mount your rigs on trailers and *HAUL WITH*

WALTER TRACTOR TRUCKS

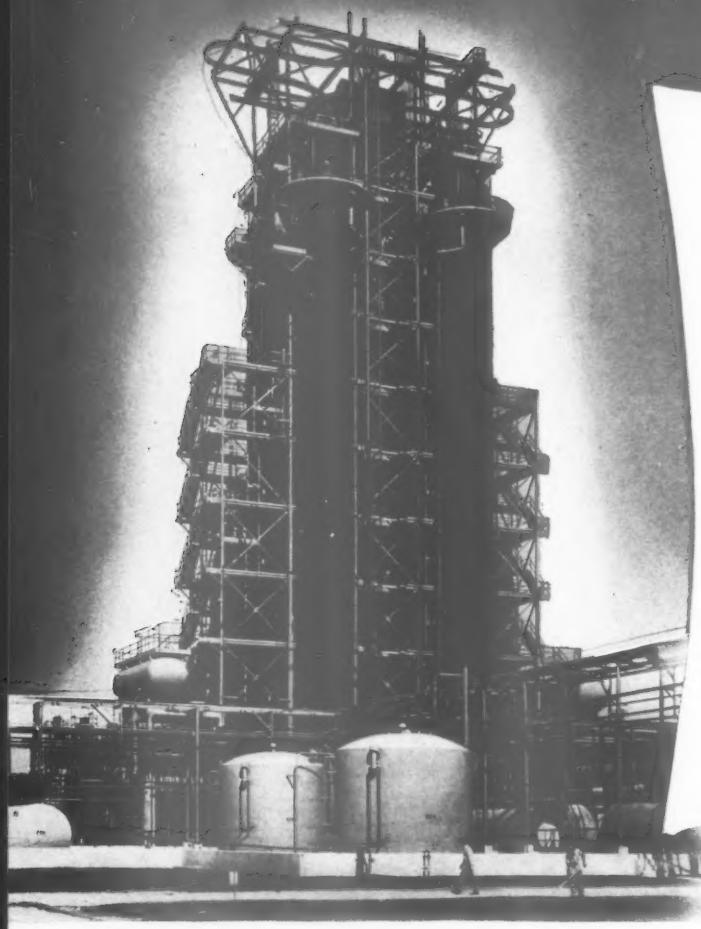
● Trailer-mounting your rigs is just like adding more trucks *without cost!* The detachable Walter Tractor Truck is not limited to one rig, as with single unit mounting. It hauls bigger rigs—hauls more rigs—cover more wells—and does other types of hauling also.

Modern drilling requires bigger rigs and bigger rigs require Walter Tractor Trucks. Only with Walter Tractor Trucks do you get high speed with enormous loads—both on the highway and *off* the highway. The 100% traction provided by the Walter Four Point Positive Drive enables them to pull unfailingly over mud, sand, ruts, slippery surfaces and grades that stop anything else on wheels. Even if one, two br three wheels lose traction, the fourth wheel still carries on until full traction is regained.

Other features of Walter Tractor Trucks include automatic locking differentials, tractor type transmission, suspended double reduction drive, engine-ahead-of-wheels, short wheelbase, hydraulic steering and air brakes. Write for detailed literature.

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave., Ridgewood 27, Queens, L.I., N. Y.

for the production of chemicals
from petroleum....!



# PIONEER

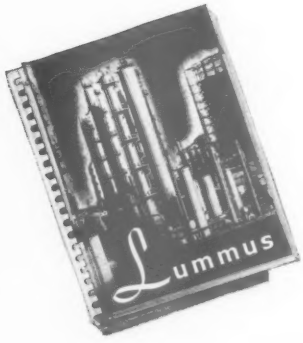
**in the development**

**of many**

**chemical and petroleum**

**refining processes!**

## LUMMUS OFFERS ITS WEALTH OF EXPERIENCE TO THE PETROLEUM AND CHEMICAL INDUSTRIES....!




For refineries and chemical companies interested in the production of chemicals from low cost petroleum sources Lummus engineers will be glad to make individual studies of products and selection of processes. Operating costs can be determined in a study of the economics for each project. Projects are followed through design, fabrication, erection and initial operation by the organization which has built numerous refinery and chemical plants, including the world's largest butadiene plant.

The development of large scale, commercial operation from pilot plant operation has long been a specialty of The Lummus Company. Among chemical processes projected to commercial operation by Lummus are those for the production of ethylene, styrene, propylene, phenol, alcohol, and butanol. In the petroleum field, Lummus has pioneered in the commercial development of solvent processes for the manufacture of lubricating oils as well as thermal and catalytic processes for the production of gasoline.

If you are interested in the economical — profitable — production of petroleum chemicals, put your problem up to Lummus.

For further information on Lummus refinery surveys and construction, write for a copy of "Petroleum Refining Processes," containing latest data, flow diagrams, photographs.

**THE LUMMUS COMPANY**

420 Lexington Avenue, New York 17, N. Y.

600 South Michigan Avenue, Chicago 5, Ill.
634 South Spring Street, Los Angeles 14, Calif.
Mellie Esperson Bldg., Houston 2, Texas
78 Mount Street, London, W. 1. England

PETROLEUM REFINING PLANTS

# for exactly the Stainless Steel Tubing You Need for Any Tough Job

THE WIDE RANGE of Croloy Seamless and Welded Stainless Steel Tubes made by B&W are analyses that assure a close match between tubing properties and practically any tubing application requiring high resistance to corrosion, oxidation, scaling, breakage and creep at elevated or sub-zero temperatures. Many of these Stainless Steel analyses are available from no other source.

But the extent to which B&W can meet specific tube requirements *exactly* with Stainless Croloys goes beyond the usual commercial range of analyses. Developing special modified stainless analyses for unusual requirements in its extensive laboratory and producing them in its own modern *melting facilities* is a regular feature of B&W service on tube problems.

You can "call on Croloy", therefore, for Stainless Steel Tubing to match not just a wide range of severe service conditions, but *any* set of adverse operating conditions which only stainless steel tubing will satisfactorily withstand.

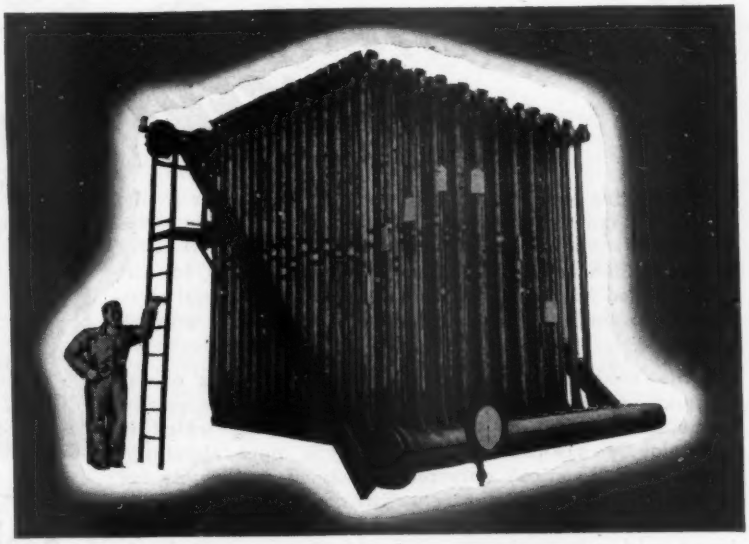
Ever since B&W produced the first stainless steel tubing commercially in the United States, Stainless Croloys have been helping to save time and expense in licking tough tubing problems in oil cracking, hydrogenation, reforming, polymerization, alkylation, gas cracking and other operations in refineries and synthetic rubber plants.

So for Stainless Tubes matched to tough jobs —exactly—call on Croloy.

**CALL ON CROLOY**

Stainless Tubing for *Effective Protection Against . . .*

WET CORROSION
DRY CORROSION
IMPAIRED FLOW
BREAKDOWN AT HIGH TEMPERATURES
SCALING
ALKALINE REACTIONS
GAS REACTIONS
EXCESSIVE RE-TUBING



Tubes in this huge catalyst case are made of a special B&W Stainless Steel developed to withstand unusually severe conditions.

Other B&W Products

THE BABCOCK & WILCOX CO.
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Water-Tube Boilers, for Stationary Power Plants, for Marine Service • Water-Cooled Furnaces • Superheaters • Economizers • Air Heaters • Pulverized-Coal Equipment • Chain-Grate Stokers • Oil, Gas and Multi-fuel Burners • Refractories • Process Equipment

**BABCOCK & WILCOX SEAMLESS & WELDED TUBES**

THE BABCOCK & WILCOX TUBE COMPANY
WELDED TUBE DIVISION, ALLIANCE, OHIO • SEAMLESS TUBE DIVISION, BEAVER FALLS, PA.

TA-1340

# *It means BETTER Protection, LONGER!*

WHEN it's more enduring protection of surfaces in the petroleum industry – particularly protection against evaporation of stored products – Permite is the choice of many a cost-minded maintenance man. And naturally so, for this ready-mixed aluminum paint goes on easier, leafs out more evenly to build up a heavier multiple coat that protects longer.

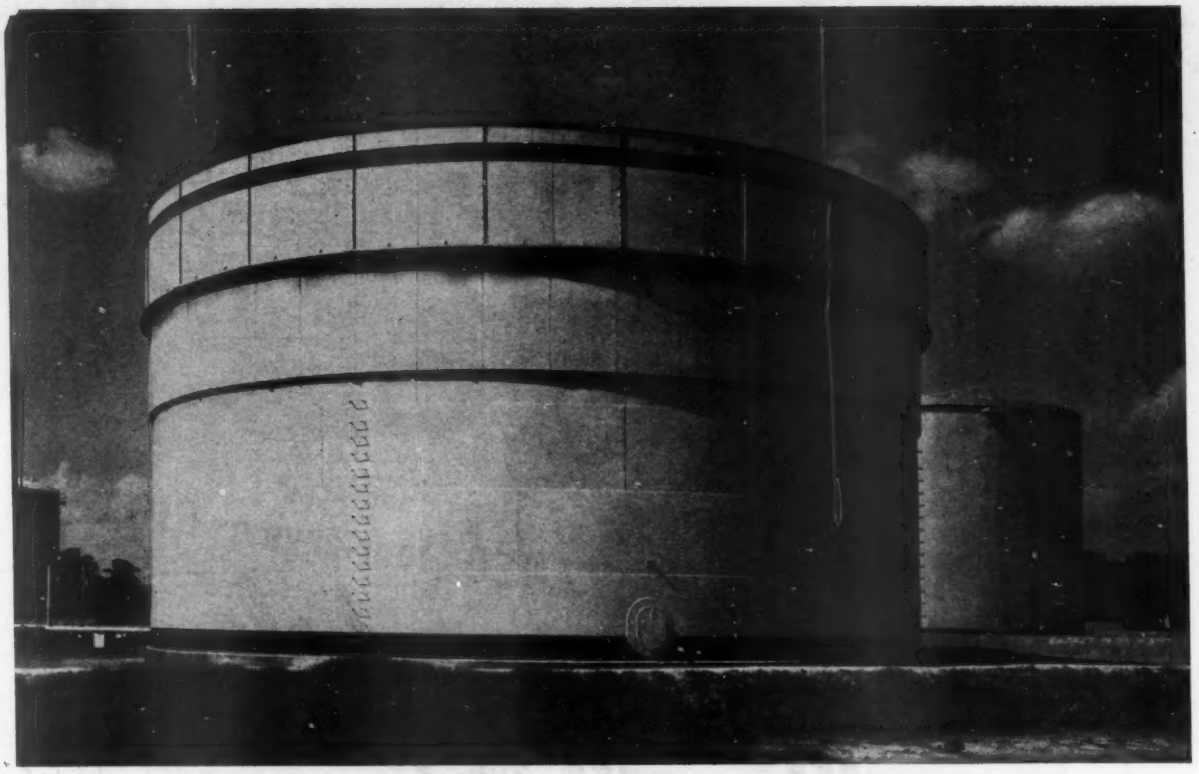
It's the Vehicle that makes the difference! Years of experience and research are behind the Permite specially formulated vehicle of resins and choice oils which is meticulously blended with the 99+% pure aluminum pigment. In America's only plant designed exclusively for aluminum paint production, chemists concentrate on giving Permite its quality of exceptional leafing – the better leafing found only in basically fine, painstakingly processed aluminum paints.

You will save time and space out your re-paints with Permite Ready-Mixed Aluminum Paint. They are uniformly ready-mixed – ready to apply when you open the can or drum. Your distributor can supply you – or write direct for quotations.

**Refinery Paint Experts KNOW PERMITE is the Right Paint —Immediately Ready to Use**

**ALUMINUM INDUSTRIES, Inc., CINCINNATI 25, OHIO**

# PERMITE READY MIXED ALUMINUM PAINTS

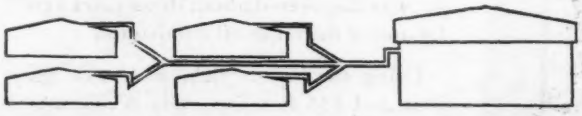


# What Price Evaporation—

## IS PART OF YOUR STORAGE DOLLAR GOING FOR GALLONS YOU'LL NEVER GET?

When gasoline is stored in ordinary cone roof tanks the cost of vapor losses per year can be figured to the penny. For example: in a 10,000-barrel cone roof storage tank filled with 100 octane gas there is a 4% evaporation loss, or 16,800 gallons, as well as a three point drop in octane rating. This 16,800 gallon loss multiplied by the market price per gallon for 100 octane gas equals THE PRICE OF EVAPORATION LOSSES.

A Graver Expansion Roof Tank absolutely prevents this loss. The roof rises or falls as the gasoline vapors expand or contract, so that they are held within the tank and not expelled. Used either singly or manifolded to several cone roof tanks (see diagram below) this equipment is saving thousands of gallons of gasoline annually and maintaining its quality at the same time.



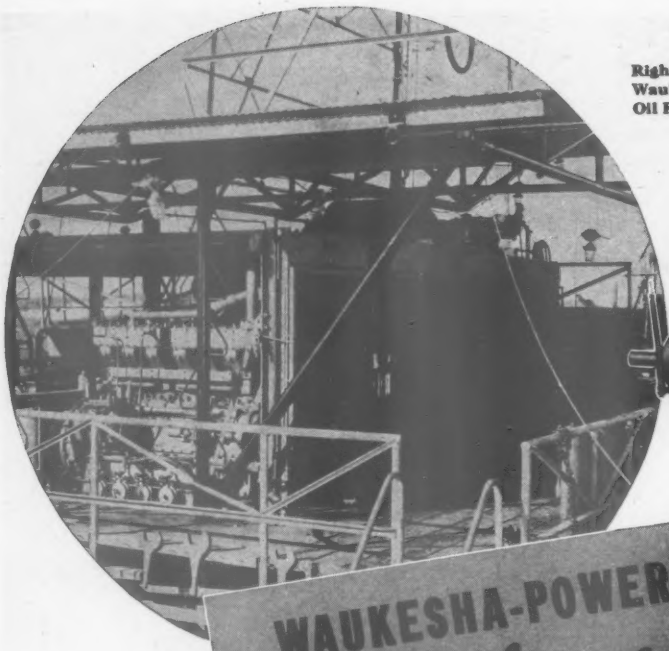
Translated into dollars, this represents enormous savings—savings which can liquidate the original investment in a comparatively short time. Graver Expansion Roof Tanks in operation at pipe line terminals and refineries of many of the country's leading oil companies, are quickly paying for themselves. Graver will be glad to show you how you can enjoy the same saving. Write, wire or phone for immediate attention.

*Fabricated Steel Plate Division of*

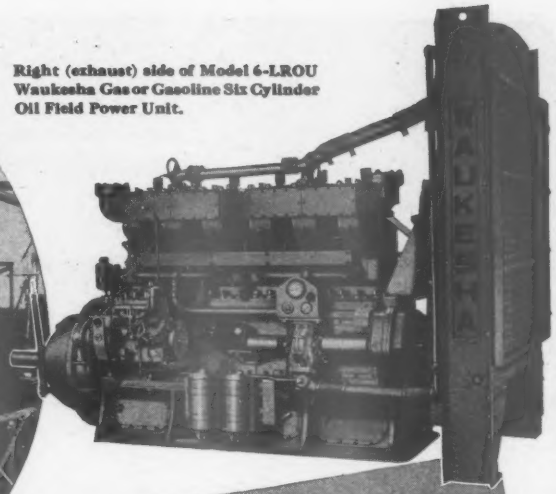
**GRAVER TANK & MFG. CO., INC.**

**General Offices: 4811-13 Tod Ave., East Chicago, Indiana**

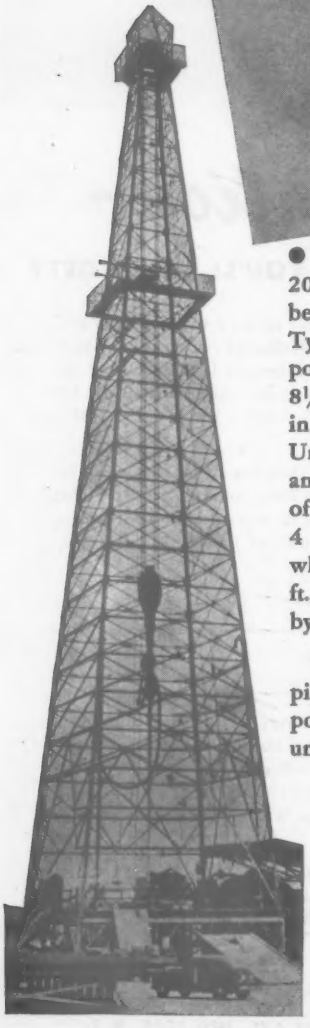
NEW YORK CHICAGO CATASAUQUA, PA. TULSA, OKLA.
PHILADELPHIA PORT ARTHUR, TEX.
EXPORT DEPT., 424 MADISON AVE., NEW YORK, N. Y.



Right (exhaust) side of Model 6-LROU Waukesha Gas or Gasoline Six Cylinder Oil Field Power Unit.




# WAUKESHA-POWERED four-engine RIG *makes more hole...* FASTER and DEEPER



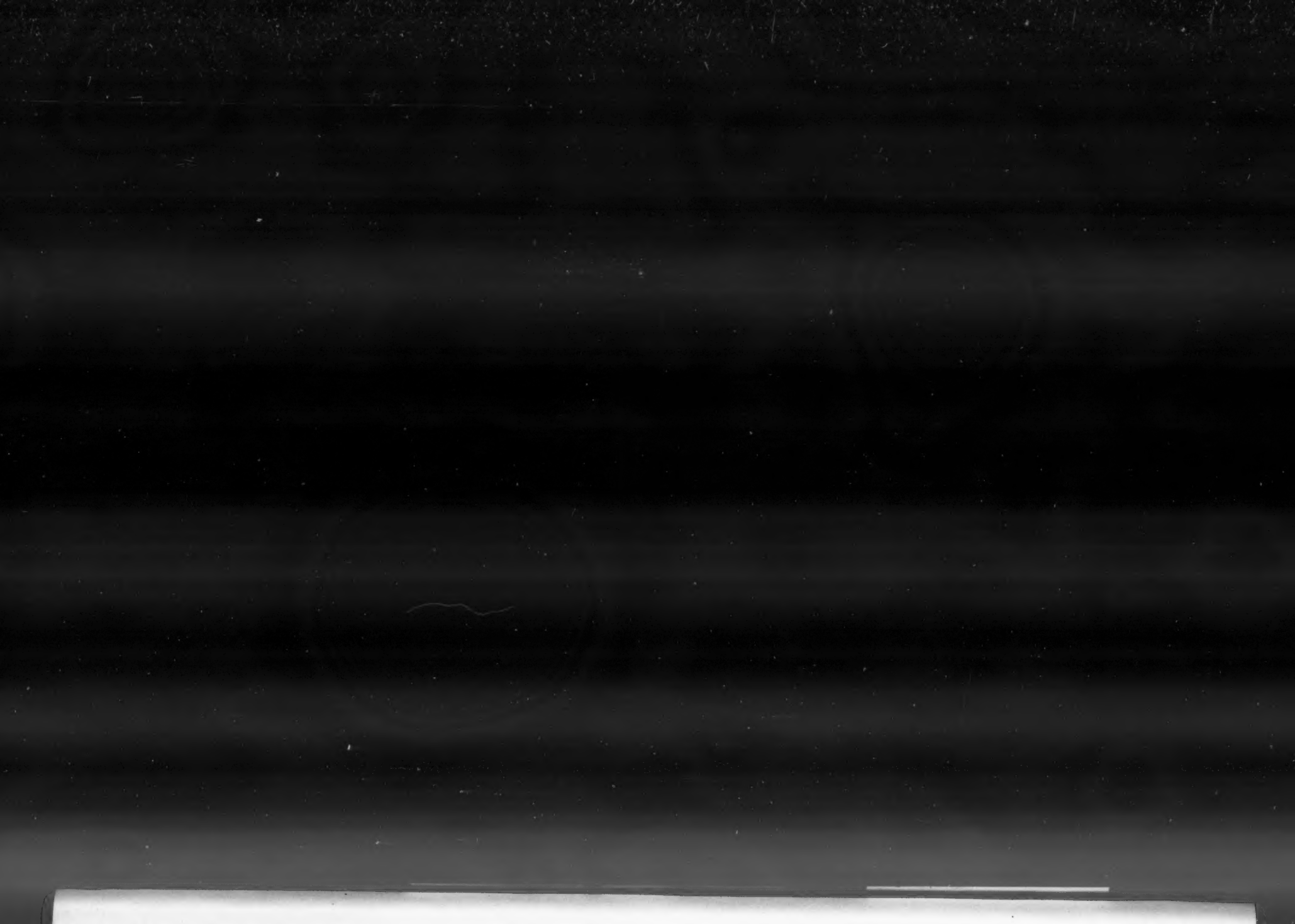
● The derrick is the world's tallest—202 ft. The rig is said by its makers to be the largest on the market—an Ideal Type 125 *Consolidated*. It's adequately powered with Model 6-LROU 6-cyl., 8½ x 8½ in. bore and stroke, 2894 cu. in. displ. Waukesha Oil Field Power Units—*four of 'em*—burning natural gas and developing an aggregate maximum of 1600 horsepower. The location—4 miles northeast of Monahans, Texas, where deep production, to about 11000 ft., was discovered about three years ago by one of the large oil companies.

Using the big derrick, with 5⅝ in. pipe and 135 ft. stands, this Waukesha-powered set-up with its four Waukesha units has *super-power*—fast, flexible, smooth, responsive—to carry on the drilling program.

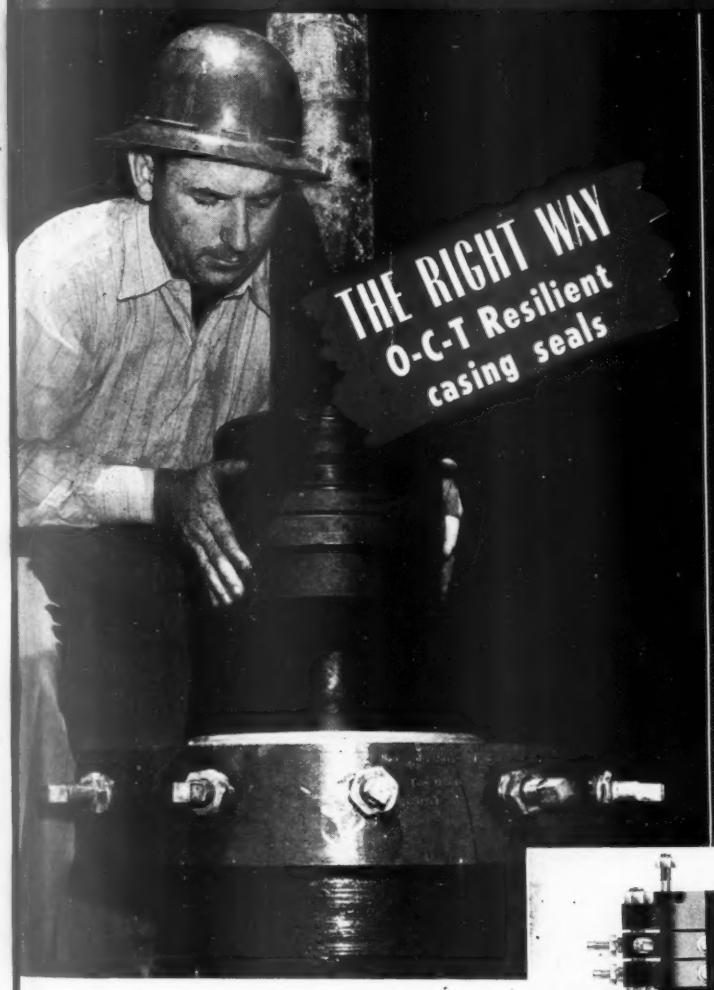
Normally two Waukeshas operate one of the heavy duty NSCO Model C-350 pumps; the other pair drives the drawworks and rotary table. Three engines may be used for either job. Usually one engine is available for mixing mud. With these four Waukesha Engines, the rig has a high standby factor. Three engines can always run the entire rig at practically full efficiency. At any time one engine may be serviced without interrupting operations. *Get* Bulletin 840. Consult Waukesha engineers on your future engine needs.

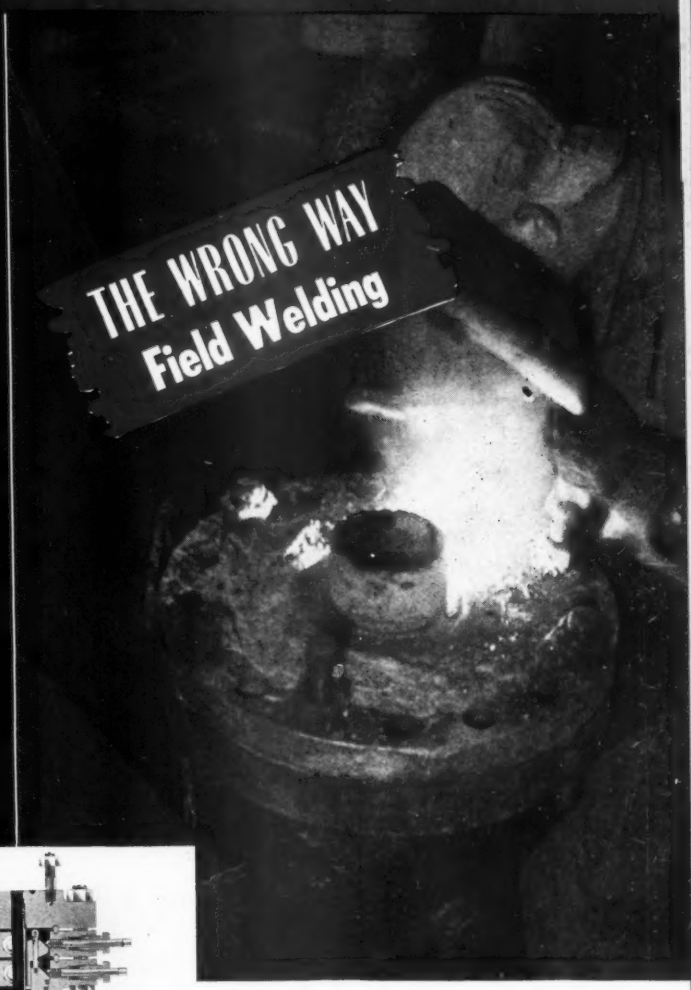
WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK • TULSA • LOS ANGELES

# WAUKESHA
## OIL FIELD POWER UNITS



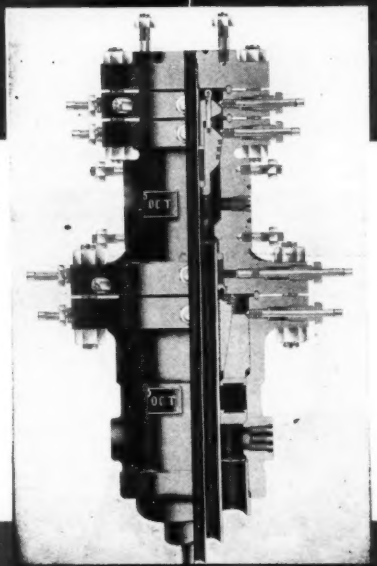
# THERE'S A RIGHT WAY AND A WRONG WAY TO SEAL CASING




O-C-T engineers have long shared the opinion with numerous operators that welded casing seals are both impractical and hazardous. Impractical because of the difficulties involved in obtaining a reliable welder when needed, transporting welding equipment to remote locations, loss of rig time, etc. Hazardous because of the lack of a means for stress-relieving after welding and, consequently, obtaining a welded seal of questionable efficiency.

On the other hand, many operators have used O-C-T well heads employing resilient seal rings with complete satisfaction. Note in the cross-section drawing presented herewith how lock-down screws provided in the casing head flange and the lower flange of the tubing head permit the application of compression on the resilient seal rings, which are made from a special heat, oil and gas resistant synthetic (Hycar) rubber. The fact that such well heads are performing satisfactorily in most of the deep, high-pressure fields throughout the Gulf Coast should provide sufficient proof of their ability to effect and maintain a pressure-tight seal indefinitely.



Write or wire for full particulars.

**Oil Center Tool Co.**

**HOUSTON, TEXAS — EXPORT: VAL R. WITTICH, 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.**

# Again, Murray is *"first"*

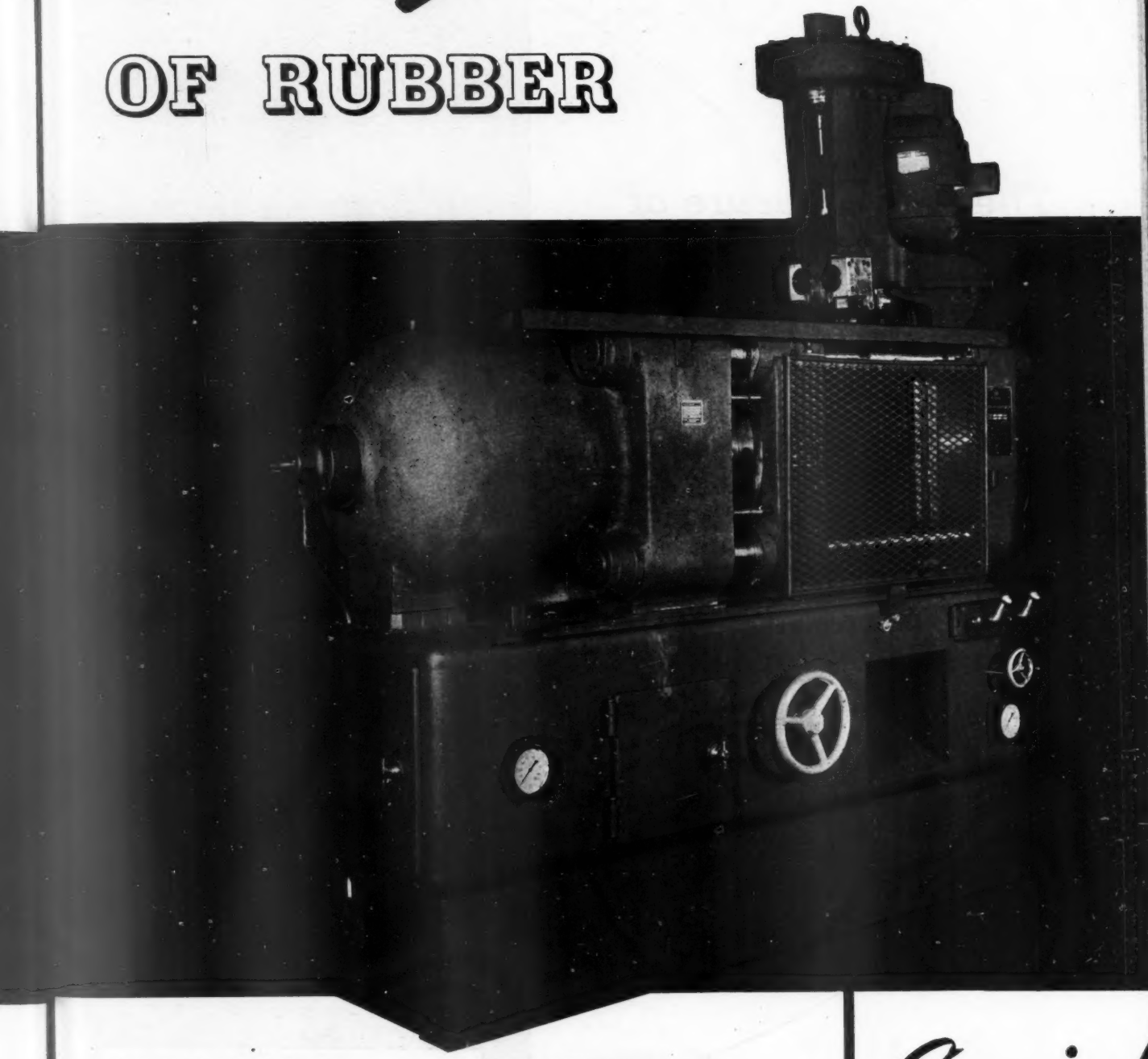
# INJECTION MOLDING

One of the first few plants in the nation to install Injection Molding facilities—the latest scientific development in rubber manufacturing—Murray has taken another important step toward realization of a mechanical rubber goods plant second to none. Injection Molding, conceived and exhaustively tested before the war, was made available to industry only recently. The machine performs equally well on either natural or synthetic rubber and imparts more favorable physical properties to the finished product. This new rubber molding method is particularly advantageous for quantity production of certain small parts. Thus, with the recent addition of an entirely new tool and mold division and an experienced engineering staff, Murray offers industry the services of the most completely modern mechanical rubber goods plant in the Southwest.

*Interior view of the Murray Tool and Mold Division, a completely equipped machine shop for the production of molds, tools, dies, jigs and fixtures.*

*with the finest –"*

# OF RUBBER



Beaumont Iron Works Company
Bethlehem Supply Company
Bowen Company of Texas
Brown Oil Tools, Inc.
Cameron Iron Works, Inc.
Dale Export Company
Gray Tool Company
Houston Oil Field Material Company
Iverson Tool Company
Johnston Oil Field Service Corporation
L-K Pump Valve Company
Lamtex Equipment Corporation
J. O. Long Company
Larkin Packer Company
Layne-Bowler Company
F. H. Maloney Company
McCullough Tool Company
McEvoy Company
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Oil Center Tool Company
Oilfield Machine and Supply Company
Otis Pressure Control, Inc.
Rector Well Equipment Company
Robinson Packer Company
Schlumberger Well Surveying Corporation
Texas Iron Works
Thornhill-Craver Company
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Well Equipment Manufacturing Company
Wilson Foundry and Machine Company
Wilson Manufacturing Company

*Service!*

Murray's prompt service and quality rubber are enabling this group of petroleum equipment manufacturers to better serve their industry.

# DOWELL

## *The real measure of Selective Acidizing is in the stock tanks*

The true gauge of the effectiveness of selective acidizing is the increased oil produced into the stock tanks.

Selective acidizing increases permeability of the tighter sections and allows more complete drainage of the reservoir.

Selective acidizing of new wells or workovers with the Dowell Electric Pilot permits the introduction of the acid into the desired part of the pay zone. This enables Dowell engineers to make treatments resulting in maximum production increases.

Backed by full laboratory and research facilities of The Dow Chemical Company, Dowell pioneered and developed selective acidizing. For the same service, the same knowledge, experience and equipment which have increased production in hundreds of wells—call your nearest Dowell station.

Other Dowell Service and Products: Mud Acid Service —Plastic Service—Water Locating Service—Industrial Scale Removal Service—Jelflake and Jelfoam, Paraffin Solvents and Inhibited Hydrochloric Acid.

DOWELL INCORPORATED • TULSA 3, OKLAHOMA
Subsidiary of The Dow Chemical Company

**EXAMPLE: Well No. 8642**

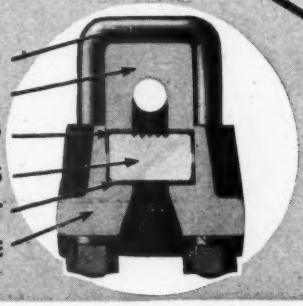
Drilled 1938. Initial potential—58 barrels per day after acidizing. Production finally dropped to 3 barrels oil and ½ barrel water per day. Permeability survey followed by Selective Acidizing with Electric Pilot restored production to 40 barrels per day.

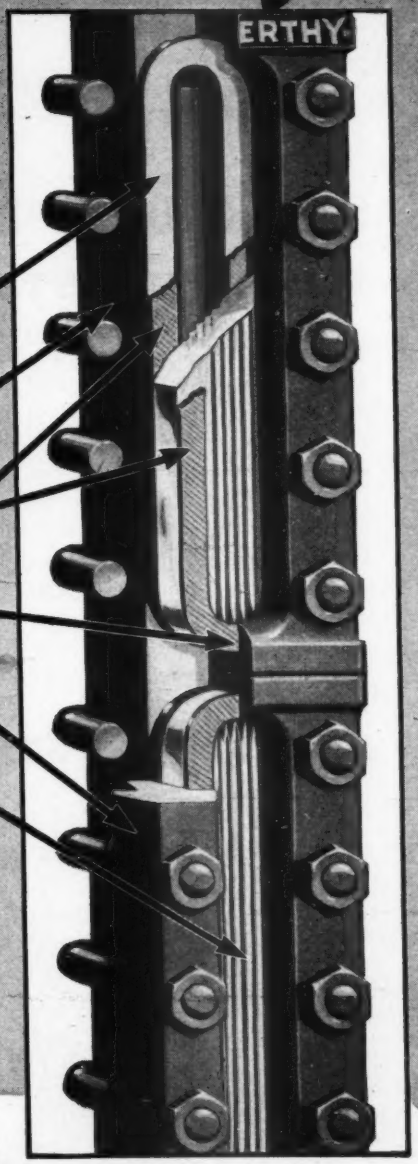
# Points of Superiority

## PENBERTHY

## DROP-FORGED STEEL *Reflex* LIQUID LEVEL GAGES

- **GASKET GLAND** machined integral with liquid chamber fits snugly into glass chamber of frame preventing gasket blow-out.
- **LIQUID CHAMBER** alloy temperature resisting steel, heat treated, accurately machined and ground. Multiple section made in one piece.
- **GASKETS** are interchangeable and provide adequate and equal resilience on both sides of glass.
- **GLASS CHAMBER** in frame machined to contour of glass providing full metal backing for gaskets.
- **FRAME** drop-forged alloy temperature resisting steel with extra heavy beam at each end.
- **PYREX GLASS** has proved its greater strength and resistance to thermal shock and erosion.



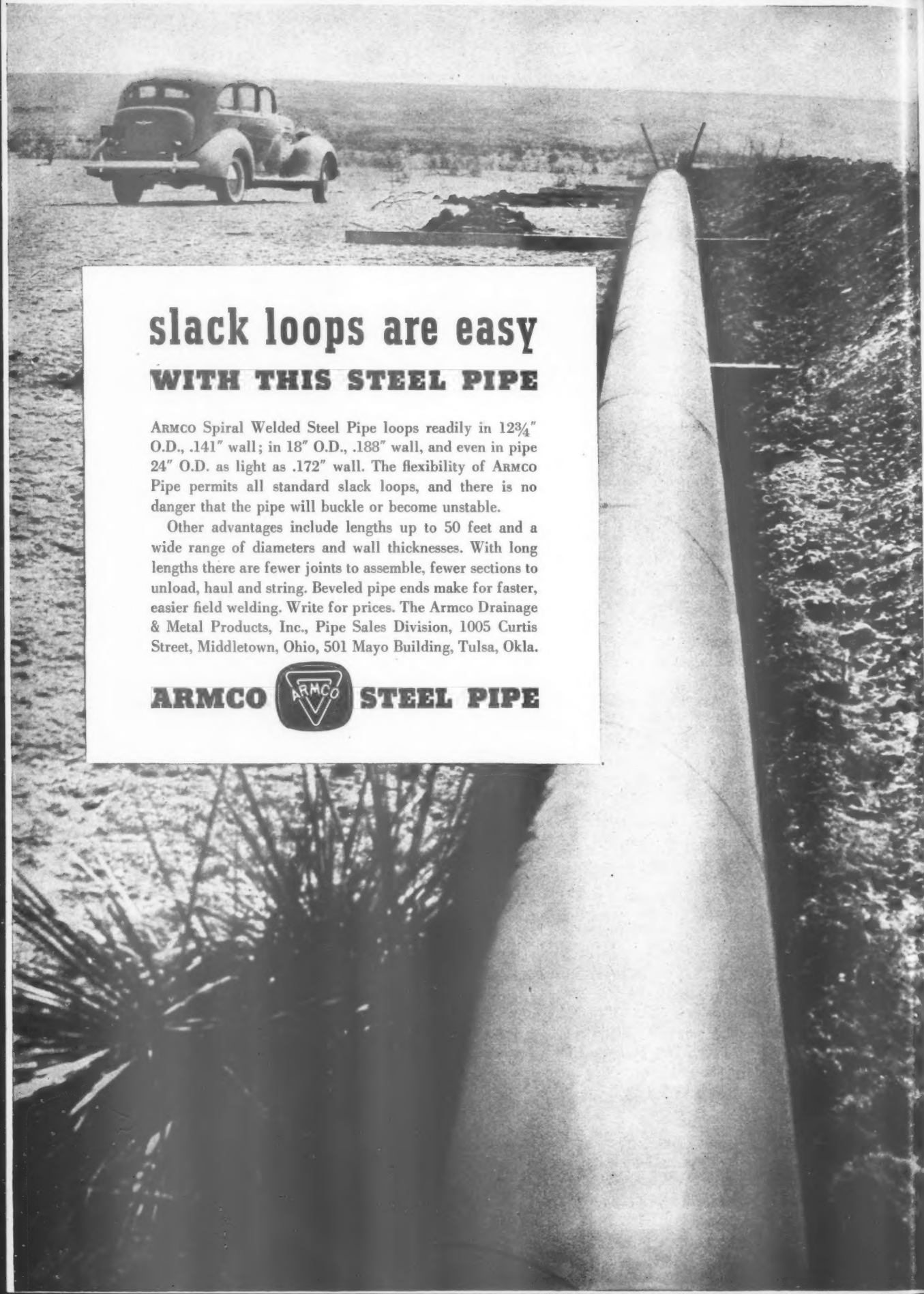

These Penberthy Drop-Forged Steel Reflex Liquid Level Gages are recommended for pressures up to 3000 lbs. per sq. in. at 100° F. and 1000 lbs. at 1000° F. They are provided in whatever lengths required and for various kinds of liquids. We shall be glad to quote upon your requirements.

*Write for New Catalog No. 34-A*

EMPTY SPACE SHOWS
**WHITE**
•
LIQUID SHOWS
**BLACK**

**PENBERTHY INJECTOR COMPANY**

*Manufacturers of* QUALITY PRODUCTS *Since 1886*
DETROIT, MICHIGAN • *Canadian Plant,* Windsor, Ont.



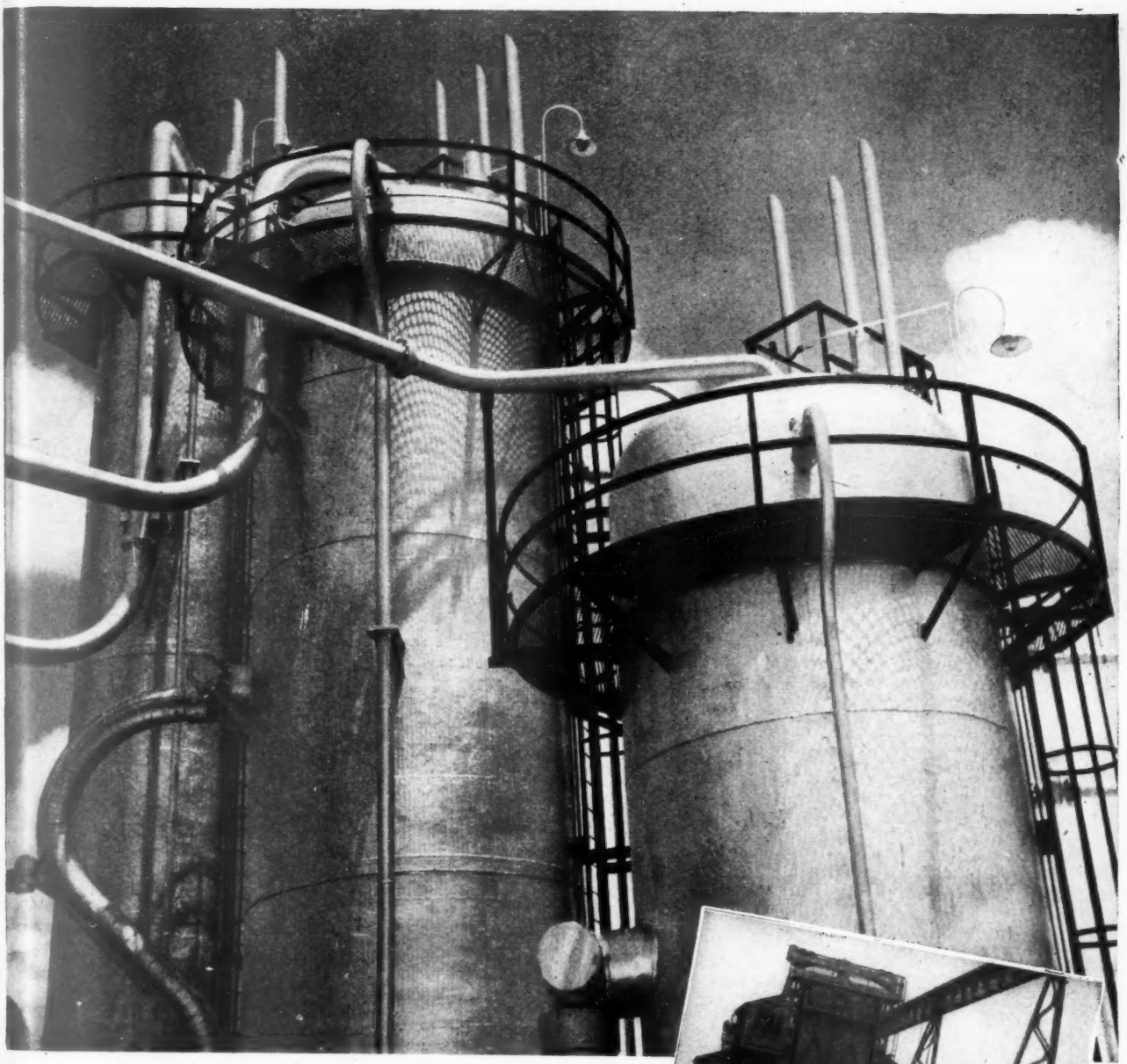
# slack loops are easy

## WITH THIS STEEL PIPE

ARMCO Spiral Welded Steel Pipe loops readily in 12¾" O.D., .141" wall; in 18" O.D., .188" wall, and even in pipe 24" O.D. as light as .172" wall. The flexibility of ARMCO Pipe permits all standard slack loops, and there is no danger that the pipe will buckle or become unstable.

Other advantages include lengths up to 50 feet and a wide range of diameters and wall thicknesses. With long lengths there are fewer joints to assemble, fewer sections to unload, haul and string. Beveled pipe ends make for faster, easier field welding. Write for prices. The Armco Drainage & Metal Products, Inc., Pipe Sales Division, 1005 Curtis Street, Middletown, Ohio, 501 Mayo Building, Tulsa, Okla.

**ARMCO** ARMCO **STEEL PIPE**



We have facilities for building welded steel pressure vessels in accordance with Par. U-68, Par. U-69 and Par. U-201 of the ASME Code or to API-ASME Specifications.

*The photo at the right shows a refinery tower leaving the stress-relieving furnace at our Birmingham plant. A new stress-relieving furnace at our Chicago plant handles vessels up to 13½ ft. in diam. by 83 ft. long in a single charge. A third stress-relieving furnace, located at our Greenville, Pa., plant, will be ready for operation about March 1st.*

# & IRON COMPANY

Tulsa, 3 ..... 1606 Hunt Building
Houston, 1 ..... 5619 Clinton Drive
Philadelphia, 3 ..... 1615-1700 Walnut Street Building
Washington, 4 ..... 703 Atlantic Building
San Francisco, 11 ..... 1254-22 Battery Street Building
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ACTIVE FIELD SERVICE • QUALIFIED PERSONNEL
RESEARCH • MODERN EQUIPMENT

C-R-C Pipe Bending Machine

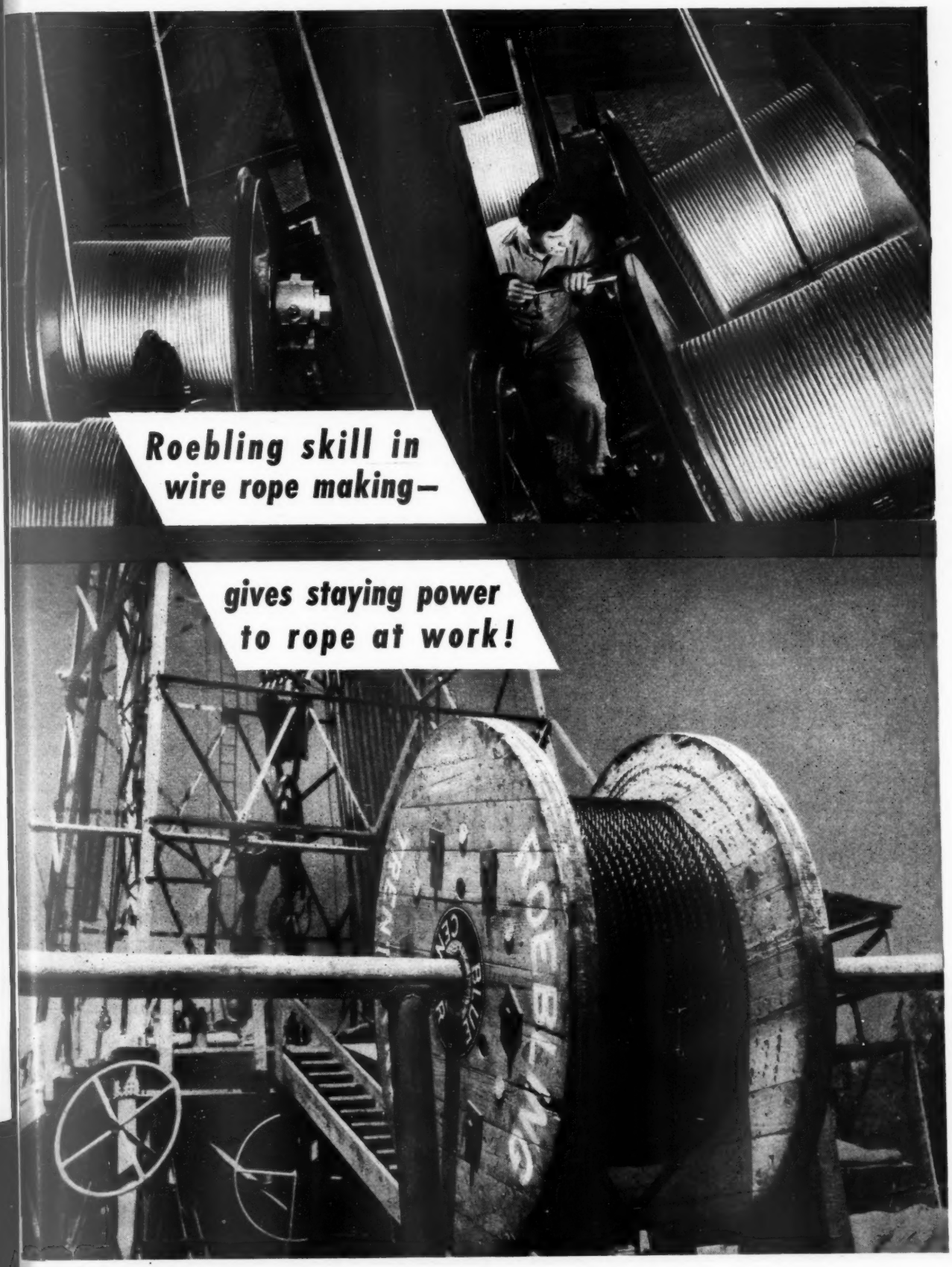
# NOW... BETTER TOOLED .... BETTER EQUIPPED!

Right now there are more than 40 CRC employees devoting their time exclusively to working for the pipe line industry . . . to building, re-designing and developing exclusive design pipe line equipment. We're better tooled . . . our shop facilities have been expanded . . . and our personnel increased for the coming year to give you better pipe line jobs at a lower cost.

Equipment shown here is representative of CRC leadership . . . of better equipment, continuously improved. That's our pledge now . . . and for the future.

**CRC**

**CRUTCHER - ROLFS - CUMMINGS**
***Pipe Line Equipment and Materials***
**HOUSTON, TEXAS, U.S.A.**


Roebling skill in
wire rope making—
gives staying power
to rope at work!
ROEBLING

# Specification for LONG TRUCK LIFE LOW OPERATING COST

**1.** Go to your International Branch or Truck Dealer and say, "These are my loads. These are my routes. I want a truck that is strong enough and big enough to do my work."

**2.** Accept the recommendation you get. Here's why: The International Truck Line is complete. It includes a truck of the right type and carrying capacity for every job. International Branches and Dealers can recommend the right trucks without prejudice.

**3.** Set up a program of regular International service. The work is done by skilled mechanics, using special International equipment and factory-standard International parts. The service is supplied by International Dealers everywhere and by the nation's largest company-owned truck-service organization—International Branches.

Today's International Trucks are the best ever built. They represent more than 40 years of truck engineering and manufacturing experience. This engineering and manufacturing has long been so outstanding that in the last 15 years more heavy-duty Internationals have been purchased for civilian use than any other make.

So buy International—service International—and don't "under truck." That's the specification for long truck life and low operating cost.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

LISTEN TO "HARVEST OF STARS" EVERY SUNDAY! N B C NETWORK

INTERNATIONAL Trucks

# Du Pont Announces Gasoline Antioxidant No. 22

A third product, a substituted diamine, has been added to the line of Du Pont Gasoline Antioxidants.

This product has been added to provide a greater range of antioxidants from which to select the one best suited to a specific gasoline. Thus, refiners are assured optimum results at lowest cost.

Gasoline Antioxidant No. 22, containing no solvents, is a liquid that is essentially 100% active ingredient. In addition to its high antioxidant effectiveness, other noteworthy properties are low water and caustic extractability and high solubility in gasoline.

For further details, just write to E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

**DU PONT TECHNICAL MEN,** *with many years of practical experience in the laboratory and in the field, will work with you in selecting or developing the right materials to meet your specific needs. Consult Du Pont also for: Gasoline Stabilizers—Oil-Soluble Colors—Lubricating Oil Additives—Metal-Working Lubricants—Fuel Oil Additives—Corrosion Inhibitors.*

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PETROLEUM
CHEMICALS

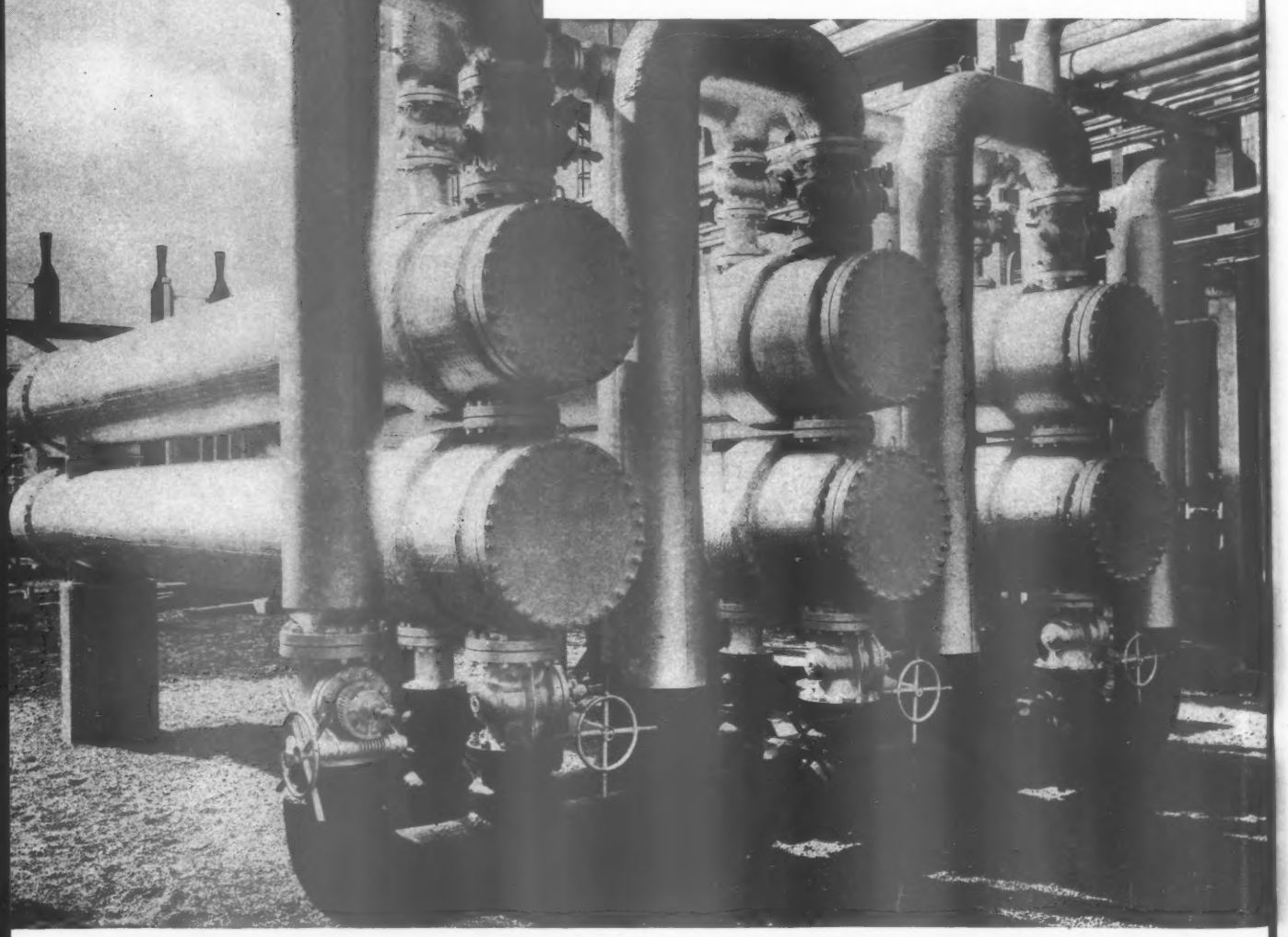
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

EFCO

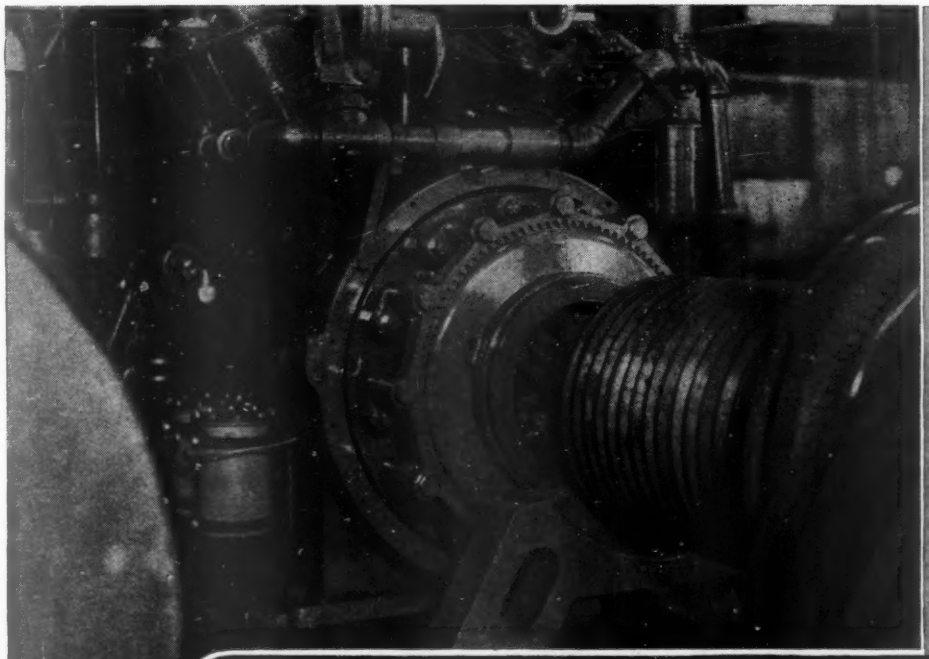
# 79 EFCO Heat Transfer Units in Shell-Sheridan Plant

**Engineers & Fabricators supplied 79 heat transfer units, including heat exchangers, condensers, reboilers and aerial condensers, for Shell Oil Company's new cycling plant at Sheridan. Let EFCO bid on your next job.**



ENGINEERS & FABRICATORS INC

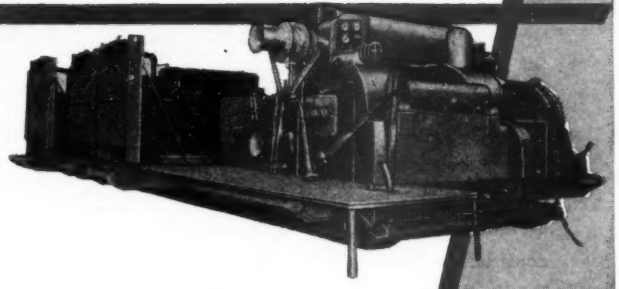
P. O. BOX 7395 EFCO HOUSTON, TEXAS



# GET A GOOD LOOK AT THIS MODERN CLUTCH!

## IT'S ONE OF THE REASONS WHY WILSON RIGS *Set the pace* IN DRILLING!

**The engine clutch, as you already know, is one part of a power rig which is of important concern to every driller. Here's one thought we want to leave with you — that through highly skilled engineering the WILSON ENGINE CLUTCH has been made the very finest available. Seventy-five per cent of the difficulties encountered with engine clutches are eliminated by use of the WILSON ENGINE CLUTCH. Let us prove to *you* the superiority of this clutch — won't you?**



**WILSON HOLDS RECORD FOR DEEPEST WELL EVER DRILLED BY A POWER RIG . . . . . .**

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**WILSON RIGS AND WINCHES may be purchased from the following: BOYAIRD SUPPLY CO., THE INDUSTRIAL SUPPLY CO., JONES & LAUGHLIN CO., MID-CONTINENT SUPPLY CO., and other recognized supply companies.**

**Wilson MANUFACTURING CO., INC.**
**WICHITA FALLS, TEXAS**

# American
## COUNTERBALANCED STROKE POSTS

## . . . Ready for delivery to your lease NOW!

● Designed to handle heavier pumping loads . . . dependably and with a minimum of servicing, sturdy American Counterbalanced Stroke Posts will prove to be real profit-makers on your lease. They are built with strength to spare all the way through . . . from the extra heavy structural steel construction through the heavy-duty bronze bushed bearings to the hook-off levers. There are no "border line" calculations in construction of today's American Stroke Posts.

And proof of their dependable field-wise characteristics is found in the longer, trouble-free service.

Teamed with dependable American Jacks, Swings, and other rod line equipment . . . American Stroke Posts save you time, man-power and money on any pumping hook-up.

Yes, American Counterbalanced Stroke Posts are ready now for immediate shipment. Write, wire, or phone TODAY!

ODESSA **FORT WORTH 1, TEXAS** KILGORE

*Unit Pumpers* • *Pumping Jacks* • *Swings* • *Crown Blocks* • *Bull Plugs*
*Swaged Nipples* • *Casing Nipples* • *Tubing Nipples* • *Braden Heads* • *Turnbuckles*

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PROCESS ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM, PETRO-CHEMICAL AND CHEMICAL INDUSTRIES

*LICENSING AGENTS FOR THE TCC PROCESS AND THE HOUDRY CATALYTIC CRACKING PROCESSES*

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of residues is recommended as the best means for producing maximum yields of high viscosity lubricants almost regardless of crude source.

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Badger has pioneered in the application of vacuum distillation of residues for the commercial production of lubricating oil fractions.

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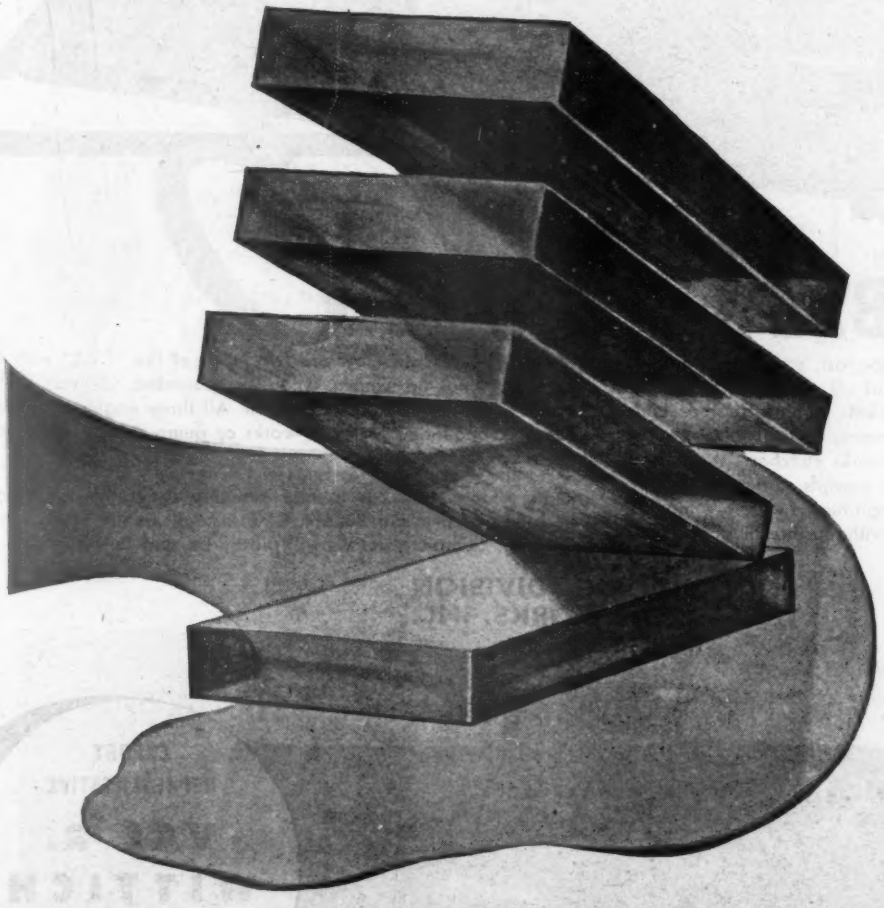
is generally the most economic method for finishing stocks of a range of viscosities from a single extracted and dewaxed stream.



FEBRUARY 23, 1946

149

**CHAMPION OF THE**

**6500-FOOT CLASS!**

# PORTABLE CT-5

**Here's the rig that has everything for fast, economical drilling to 6500 feet: Complete enclosure of all moving parts, force-feed lubrication, machine cut sprockets of heat-treated steel, multiple width heavy-duty roller chains, water-cooled brakes and the latest innovation in draw-works clutches . . . a cone type hydraulic clutch system which permits shifting from any transmission speed instantly into high-high by simply manipulating the clutch controls, and without throttling engines, stopping load, or shifting gears.**

Shown above and below are two views of the "CT-5" with a 3-engine hook-up which, when compounded, delivers 439 brake horse-power at 1200 r. p. m. All three engines can be easily compounded for draw-works or pump should the need arise.

Features too numerous to mention here are fully described and illustrated in our Bulletin CT-5, as well as the Composite Catalog. Complete details will gladly be sent on request.

**PORTABLE RIG DIVISION**
**TEXAS IRON WORKS, INC.**
**HOUSTON, TEXAS**

**EXPORT REPRESENTATIVE**

**VAL R. WITTICH**

**30 ROCKEFELLER PLAZA**
**NEW YORK CITY**

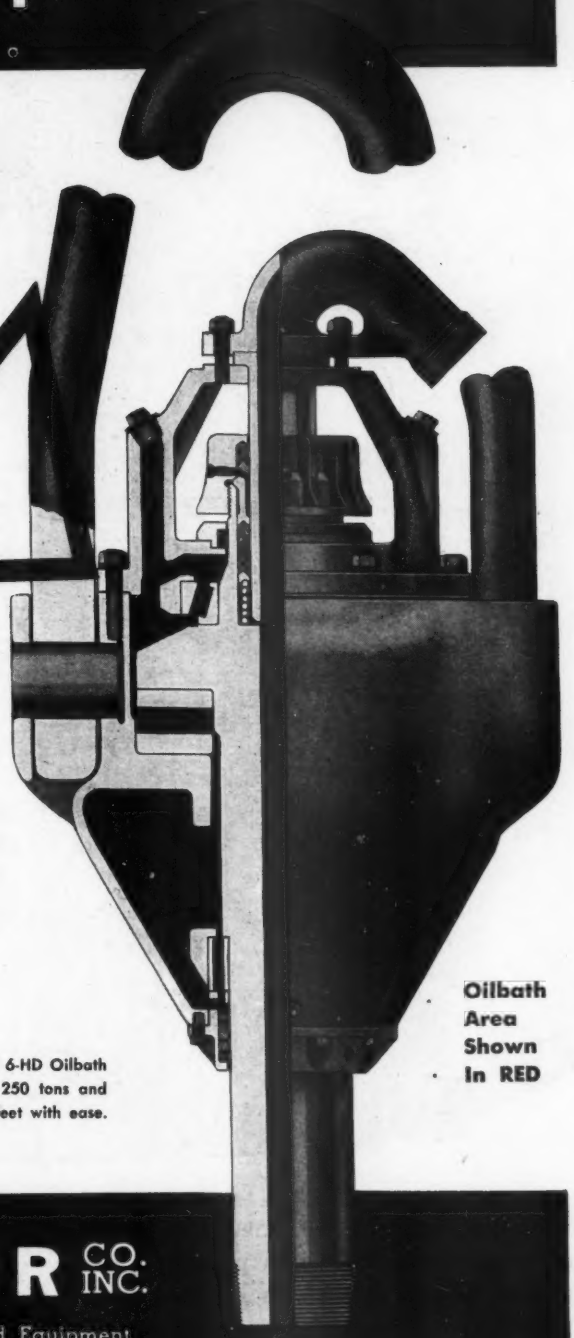
# MORE DRILLING PROFITS FOR YOU.....

## WITH BREWSTER OILBATH SWIVELS

Like many other industries, profitable drilling depends on economical operation of the equipment. Considering the profit angle, Brewster has designed five sizes of heavy duty Oilbath swivels. Each swivel operates on anti-friction roller bearings submerged in life-giving oil. Friction is reduced—bearings last longer enabling you to complete the job quicker without swivel break-downs.

All five sizes of Brewster swivels give you this Oilbath feature along with many other profit-making advantages. For more complete details write or wire today.

This is the smallest Model 3-TS Oilbath Swivel. It is rated at 25 tons dead load and is recommended for depths to 1,800 feet.



Oilbath Area Shown In RED

The "Big Brute" is the Model 6-HD Oilbath Swivel. Dead load rating is 250 tons and it handles depths to 10,000 feet with ease.

**THE BREWSTER CO. INC.**

For Over 30 Years Makers of Fine Oil Field Equipment

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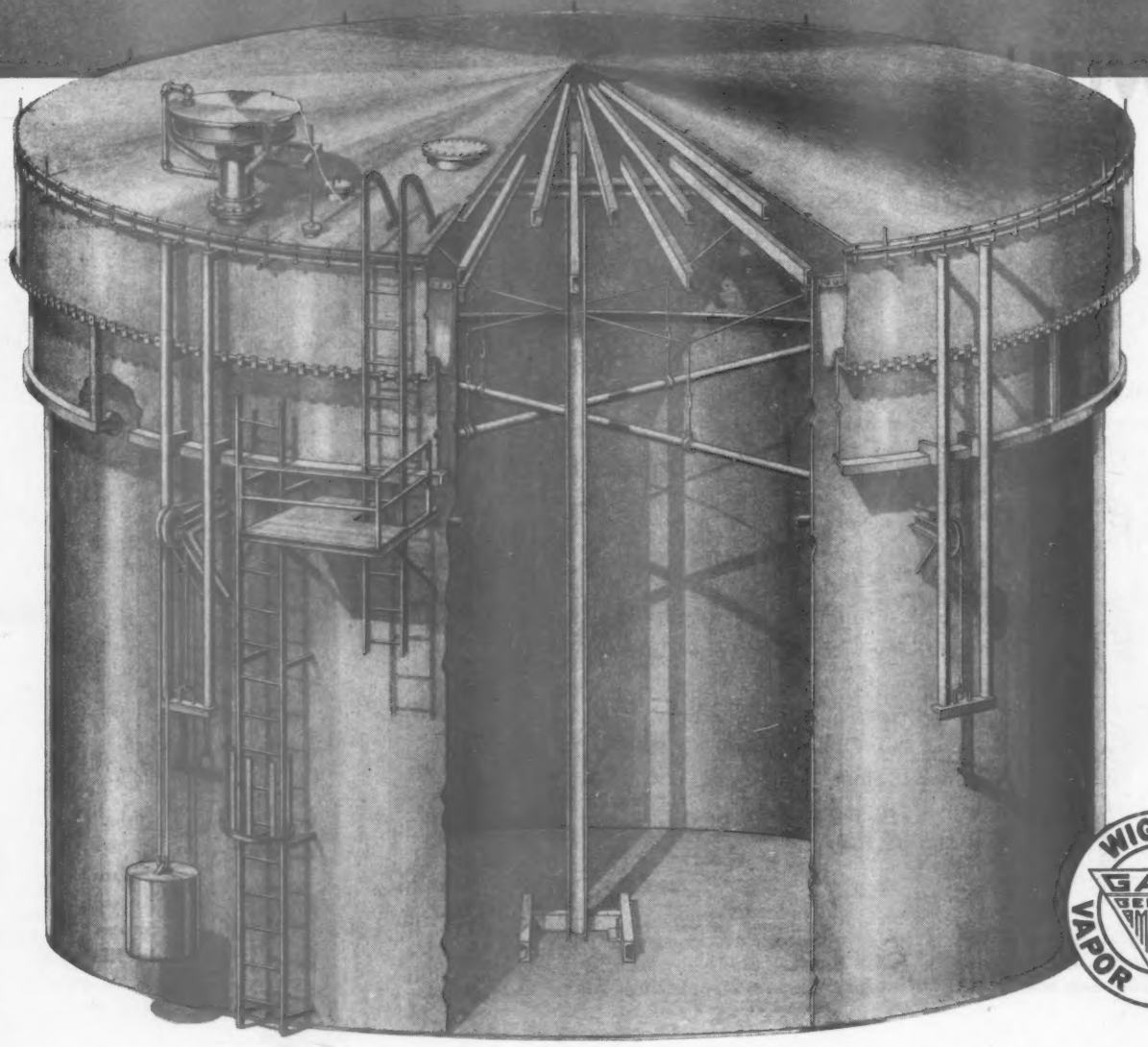
# STOP COSTLY EVAPORATION LOSSES

## WITH THE NEW IMPROVED

# WIGGINS DRY SEAL LIFTER ROOF

*A GENERAL AMERICAN-WIGGINS VAPOR SEAL*



WIGGINS GATX GENERAL AMERICAN VAPOR SEALS

This new, improved Dry Seal Lifter roof is an expansion roof which protects against costly "breathing" losses of volatile and valuable constituents of petroleum products. Its gas-tight skirt, curtain, and fender construction does away with corrosion problems encountered with other types of roofs.

Highest efficiency and minimum maintenance make the new, improved General American-Wiggins Dry Seal Lifter roof a profitable investment, for by saving evaporation losses and maintaining quality, the General American-Wiggins Dry Seal Lifter roof actually pays for itself.

**GENERAL AMERICAN TRANSPORTATION CORPORATION**

135 South LaSalle Street, Chicago

*with branch offices in:* New York • Washington • Cleveland • Buffalo • Pittsburgh • St. Louis
New Orleans • Tulsa • Dallas • Houston • Seattle • Los Angeles

* Dimensions of this unit are: Width overall, 33"; Length overall, 114"; Height, 60". Total weight is less than 4,000 pounds.

**AUXILIARY COMBINATION**

*Rig Lighting Plant*
*Electric Welder*
*Accessory Drive for Wash Down Pump*
*Air Compressor Unit*

**ENGINEERED AND BUILT INTO**

# *One Compact Unit*

**by STEWART & STEVENSON SERVICES**

Something distinctly different from conventional units is this Stewart & Stevenson Combination Auxiliary Unit. It serves a multitude of purposes, yet takes up practically the same space as a simple rig lighting plant! The unit illustrated is rated at 15 KW lighting capacity, 200 amperes welding capacity, 17 cubic feet air compressor capacity—and provides 25 H.P. available for operation of wash down pumps, shale shakers, and other uses on the rig.

The unit is completely self contained. Mounted on a heavy duty skid type base, it contains a large capacity fuel tank mounted just under the top of the hood, a control panel for complete control of engine, lighting generator, and electric welding generator as well as an air receiver tank built into the sub base. The complete unit is enclosed in a weather resistant sheet metal hood with easily removable side panels.

You have the choice of either G. M. Diesel engines for power, or Continental natural gas engines. The power is sufficient, with either engine you choose, to operate all components simultaneously and still have at least 25% reserve power, therefore assuring long life and trouble free service.

* Small units are also available with correspondingly less weight and reduced dimensions for greater portability. For free engineering assistance on your drilling power problem see

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*Plant and General Offices*
**4516 HARRISBURG BLVD., HOUSTON 2, TEXAS**
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*Distributors for*
G. M. DIESEL Engines . . . CONTINENTAL Red Seal Gas, Gasoline, Butane Engines.

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PARTS - SERVICE
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## ...FOR THOSE BIG JOBS

NATIONAL AIROIL BURNERS

for FUEL OIL
. . . for GAS

TYPE SAL

## A LARGE CAPACITY OIL BURNER ...FOR FIRING LARGE BOILERS

Here is a steam atomizing oil burner that will turn 600 gallons of heavy fuel oil into 90,000,000 B.T.U. liberation every hour. This burner, our Type SAL, is giving efficient service with large boilers in many refineries and chemical plants. In open hearth furnaces, cement kilns and dryers, the Type SAL has a record of top performance; it is also readily adaptable for use in combination with powdered coal, coke or natural gas in boilers of the largest size.

Either steam or compressed air, or fuel gas may be used for atomization. Only occasional cleaning and a minimum of maintenance is necessary to keep the Type SAL burner in first class condition.

Let us apply our nearly 35 years' experience in the design and manufacture of fuel oil and gas burner equipment to the solution of your combustion problems.

SIGN AND MAIL THE COUPON. Our bulletin 24 with detailed description of the Type SAL will be sent for your files.

National Airoil Burner Company, Inc.
1236 East Sedgley Avenue
Philadelphia 34, Pa.

Gentlemen:

Please send me complete information on the Type SAL Oil Burner.

FIRM _____

ADDRESS _____

CITY _____ STATE _____

NAME _____ TITLE _____

**NATIONAL AIROIL BURNER CO., Inc.**
1236 E. Sedgley Ave., Philadelphia 34, Pa.
Texas Office: 2nd National Bank Bldg., Houston.
*Established 1912* *Incorporated 1917*
OIL BURNERS • GAS BURNERS • GAS PILOTS • PUMP SETS • EXPLOSION DOORS • ACCESS DOORS • AIR DOORS • BURNER BLOCKS • FURNACE OBSERVATION WINDOWS

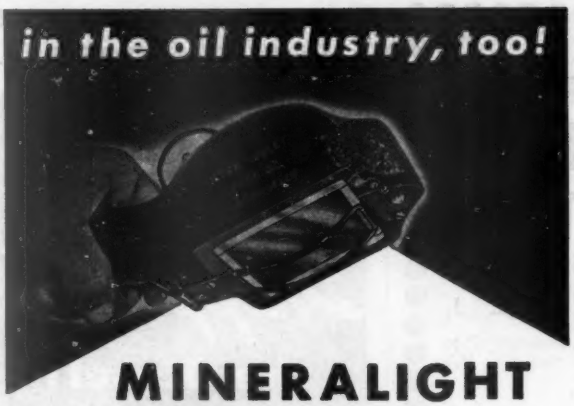
HELIUM PLANT AT EXELL, TEXAS

**HELIUM RECOVERY**
*makes use of*
*Florite* *

The fact that granular Florite Desiccant is employed as a drying agent in the processes of modern helium recovery at the Exell, Texas, helium plant of the U. S. Bureau of Mines, is one of many examples of the adaptability of Floridin products to a wide range of exacting uses. As adsorbents, desiccants, catalysts and catalyst carriers, Floridin products have become widely known and approved by the petroleum, vegetable-oil refining, and chemical manufacturing industries. Write for descriptive material, indicating what application you have in mind.

* *Trade Mark Registered.*

**FLORIDIN COMPANY, INC.**
ADSORBENTS
Room 53, 220 Liberty Street Warren, Pa.




# MINERALIGHT

**ULTRA VIOLET (BLACK LIGHT) LAMPS**

**FIND HIDDEN VALUES**

***instantly, easily, accurately***

This ultra-violet lamp can help solve your oil testing problems . . . in the field and in the laboratory. Write today for the authoritative bulletin, *Fluorochemistry in Petroleum Science*. Learn how MINERALIGHT can be used for quick, easy petroleum identification in field and laboratory testing, prospecting and analysis of cores, sands and muds.

**ULTRA-VIOLET PRODUCTS, INC.**

5205 SANTA MONICA BOULEVARD • LOS ANGELES 27, CALIFORNIA

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**BLACK on WHITE**

**for**

**BETTER SIGHT**

WYTEFACE "A" Steel Tapes have *raised* black graduations on a crack-proof white surface. Easy to read in any light, from any angle. Faster measurements with fewer errors. Designed for hard service. White background is protected by raised steel markings and rims. Resists abrasion from rails, pipe, rocks, concrete. Protected against rust. See your supply house. Write for catalog.

**KEUFFEL & ESSER CO.**

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*Drafting Reproduction Surveying Equipment and Materials Slide Rules Measuring Tapes*

**WYTEFACE "A"**

STEEL GAUGING TAPES

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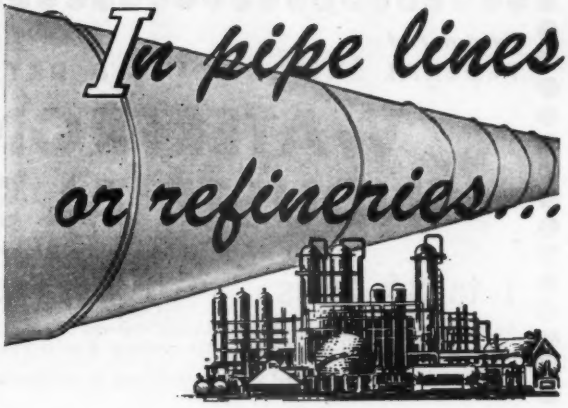



# GOULDS PUMPS

## *Can take it!*

Day in and day out, Goulds Triplex Double-acting Reciprocating Pumps handle as many as 4,700 to 55,000 barrels every twenty-four hours and at pressures up to 1,000 P.S.I. To build pumps for such service requires a thorough knowledge of pump design and engineering.

Few, if any, pump manufacturers can match Goulds record. It's important to you because when you are handling oil, the pump must first be safe to use and second, dependable in continuous, heavy-duty service. As pump specialists for 98 years, Goulds has developed standard lines of reciprocating, rotary and centrifugal pumps from which you can usually select *the* pump for *the* job. To save time . . . to save money . . . bring your pump problems to pump headquarters. Literature on request.

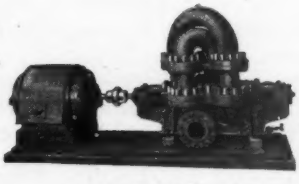


**Fig. 3365—Goulds High Pressure centrifugal pump designed for heavy-duty, 24-hour service.**

**Goulds PUMPS, INC.**

*the* PUMP FOR *the* JOB SENECA FALLS, N. Y.

By order of
FEDERAL SHIPBUILDING & DRY DOCK CO.

# WATERFRONT INDUSTRIAL SITE

2700 ft. on Hackensack River

**1 to 84 Acres** • **JERSEY CITY, N. J.**

Extensive frontage on Route #1 and Lincoln Highway • In "Free Lighterage" Zone 30-foot U. S. Channel • R. R. Sidings available 5 miles from New York City Hall

*To be offered in 4 parcels and in its entirety at*

# AUCTION

**SAT., MAR. 9th, 2:30 p. m.**

IN PLAZA HOTEL, JOURNAL SQUARE, JERSEY CITY, N. J.

*SEND FOR BOOKLET "O"*

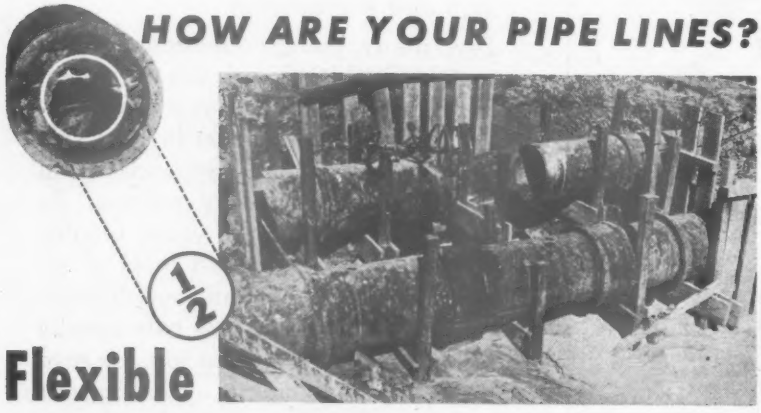
Joseph P. Day INC.

Stephen A. McDonald, Auctioneer

CHRYSLER BLDG.
NEW YORK CITY 17

PHONE:
LExington 2-5000

## HOW ARE YOUR PIPE LINES?




# Flexible

## CAN RESTORE THEIR ORIGINAL CAPACITY

HOW OLD are your pipe lines? And what is their condition now? The lines pictured were reduced to a fraction of their original capacity when opened for cleaning.

Let Flexible investigate your pipe lines – our experts will be glad to estimate the cost of cleaning the lines and restoring their original capacity. A fleet of completely equipped service trucks with supervised crews are strategically located to give pipe cleaning service throughout the West. Write or wire today!

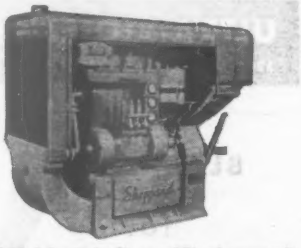
**FLEXIBLE SEWER-ROD EQUIPMENT CO.**
*Pipe-Cleaning Division*
9059 VENICE BOULEVARD • LOS ANGELES 34, CALIF.

## WHERE LIGHTS BURN AND WHEELS TURN...

# DIESEL'S the Power... Sheppard's the Diesel!

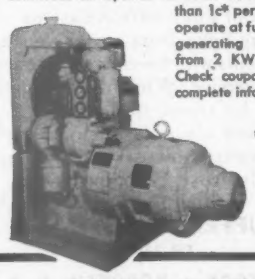
When power costs become an important item of operating expense, it's time to investigate the economy of a Diesel engine.

Sheppard Diesels have *proved* their economy of operation by reducing power costs in hundreds of installations... *frequently as much as 65%!* If *your* answer to the rising cost of labor and materials is the reduction of power bills—remember, *Diesel's the power . . . Sheppard's the Diesel!*



Model 6A-1 3-cylinder Sheppard Diesel power unit develops 25 continuous horsepower at 1200 R.P.M. Delivered complete...ready to run...including power take-off and clutch. Costs about 96c* to operate at full load for an 8-hour day. Other models ranging from 3¾ H.P. to 56 H.P. The coupon below will bring complete information on the power unit suited to your requirements.

Sheppard 5 KW generating set is powered by a Model 7 1-cylinder Sheppard Diesel developing 8 continuous horsepower at 1200 R.P.M. Costs less than 1c* per KW hour to operate at full load. Other generating sets ranging from 2 KW to 36 KW. Check coupon below for complete information.



*Using 8c per gal. fuel oil

**R. H. SHEPPARD COMPANY, INC.**
**22 MIDDLE ST., HANOVER, PA.**

Forward complete information on Sheppard Diesel ——Power Units ——Generating Sets.

*Name*_____

*Address*_____

_____

*Power Unit H.P.*____ *Generator Capacity*____

PIPE FITTINGS

# Drop Forged

## by LADISH

## for Greater Dependability

RESISTANCE TO STRAINS of expansion and contractions over wide temperature ranges is measurably improved with the tougher, more compact grain structure provided by Drop Forging.

RESISTANCE TO FATIGUE is accomplished by accurately controlled grain flow for maximum strength at vital points provided by Drop Forging.

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FREEDOM FROM INTERNAL DEFECTS is assured by the denser, more homogeneous metal structure of Drop Forgings.

UNIFORM WELDABILITY
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LONGER LIFE

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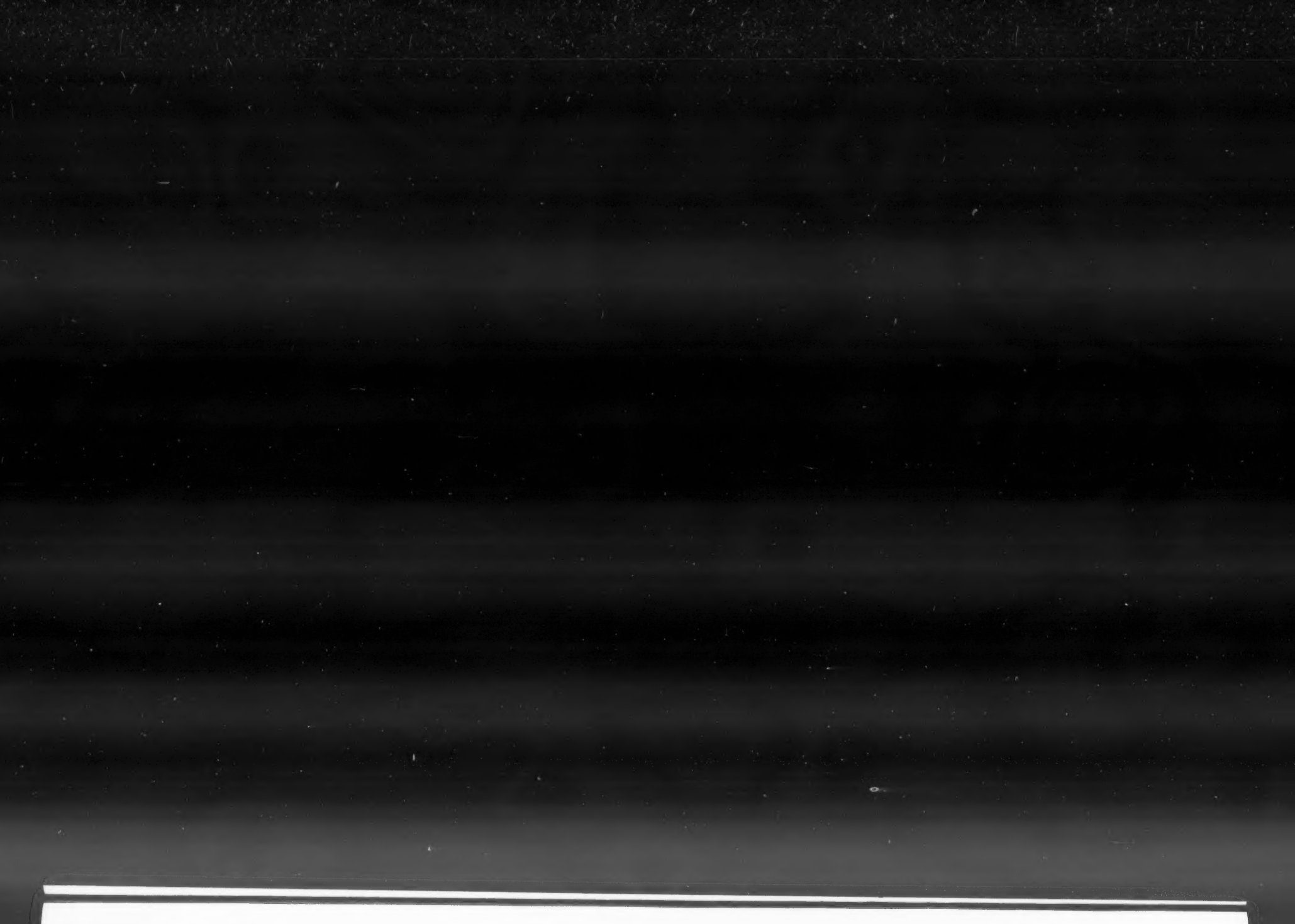
Know-how, from 33 years experience,
plus facilities with which to execute it,
is industry's assurance of the ultimate
in quality in products fabricated by
Wyatt's



# Classified Advertising

***The Market Place for the Oil Industry***

### EQUIPMENT WANTED

WANTED TO BUY: 2—40-h.p. gas engines, either Superior or Webber, but must be in first-class condition. Write P. O. Box 2451, Tulsa, Oklahoma.

WANTED TO BUY: One core drill rig, capable of drilling 700 feet, with a supply of rods. Address Merry Brothers, Demopolis, Alabama.

**WANTED AT ONCE**

15,000 or 18,000 gallon 200# W.P. propane storage tank in good condition or would consider entire propane bottling plant if could be dismantled and shipped.

Need 500 ICC 4B240 propane cylinders 100# capacity immediately. If cylinders must be manufactured advise delivery date.

Box B-103,
The Oil and Gas Journal,
Tulsa, Oklahoma

**WANTED**

Askania vertical-intensity temperature-compensated recording field balance for daylight loading.

Submit full particulars and price to

**WILLIAM M. BARRET, INC.**
Giddens-Lane Building
Shreveport 4, Louisiana

### EQUIPMENT FOR SALE

PIPE-LINE EQUIPMENT for sale. List furnished on application. Oil Field Service Co., Box 924. Ardmore, Okla.

**FOR SALE**

One Hartley type gravity meter complete with accessories. New condition. Built by Frost.

**Box B-111, The Oil and Gas Journal**
Tulsa, Oklahoma

**TANKS FOR SALE**

8000 & 10,000 GALS.
TESTED — COILED & UNCOILED
TANK CAR TANKS
REASONABLY PRICED — EXCELLENT CONDITION
WIRE — PHONE — WRITE

**Merchants Steel & Supply Company**
105 So. La Salle St.
Chicago 3, Ill. Phone—Fra. 5312

### EQUIPMENT FOR SALE

CABLE DRILLING TOOLS: Complete line of drilling and fishing tools, supplies, lines, bits, casing, elevators and lease equipment. Orders filled promptly. Degen Pipe & Supply Company, Box 107, Red Fork Station, Tulsa, Oklahoma.

REFINERY - CLARKE COMPRESSOR, Treating Drums, Clay Towers, Bubble Towers, Flash Towers, Reboilers, Electric Cable, Switches, Sharples Centrifuges, Pipe Stills, Blowers, Electric Motors, New structural steel building. Priced for quick sale. P.O. Box 610. Mt. Pleasant, Texas.

WILL SELL reverse circulating equipment. Everything ready to go, including pump and motor, rotary head and Kelly swivel, weight indicator, rotary hoses, suction hoses, all swedges and connections. Portable steel circulating tank and drill collar. Most all new equipment. Compact and suitable for one truck and trailer load. Tom D. Gaskill, Phone 2327, Shawnee, Oklahoma.

FOR SALE: Pumping units: 2 Oilwell SC-20, 2 Jensen 14, 1 Reed 14, 6000 ft. ¾ sucker rods. Casing pumps 7 in. and 5½. Spudder attachment to Wilson winch w. cable tools. Seguin, Texas. P.O. Box 926. Phone 682.

ROTARY Drilling Rig suitable for shallow drilling Mast Poles, WitchTex Drawworks, 5⅞ x 12 Oil Well Pump, 2000 ft. 4½ in. Drill pipe. Recently finished 1900 ft. contract. Rig is complete. Price $8,500. C. G. Hart, 2400 Grant St., Wichita Falls, Texas.

2—80 H.P. Tips Semi-Diesel Engines.
2—48 KWKVA Western Electric Generators with air compressor, tank, and switchboard. Price entire lot, $7,500.00.

**MITCHELL MANUFACTURING CO.**
Fort Smith, Arkansas

**FOR SALE**

30 Used 3½-4 Ton Model CU Four-Wheel Drive Trucks. Wheelbase 148". SRS or SRK Waukesha Engines. 5 Speed Transmission with PTO. 11:00 x 20 tires, duals rear. Ideal for well servicing units and other applications.

Also used engines and trailers for sale.

Write or call

**GLENN BULLARD**
LD #22, Box #471
Duncan, Oklahoma

**ADMIRALTY TUBES**

⅝" 16 gauge; ¾" gauge;
1" 14 gauge; 1" 16 gauge

(All tubes have been reconditioned and tested at 1200 pound pressure).

**BANKOFF PIPE and SUPPLY COMPANY**
Phone 2-9856 Box 2301
Tulsa 1, Oklahoma

### EQUIPMENT FOR SALE

FOR SALE: 5,000' 4½" OD 16.60# Range 2 drill pipe with regular tool joints; 6,109 4¼" OD 16.60# Range 2 drill pipe with A.P.I. F.H. tool joints. Also 1 steel drilling rig complete with boilers and drill pipe capable of drilling 6,000'. 7 Nixon Gas Lifts complete with weights, lifts and line. Wire write or phone Louisiana Iron & Supply Co Shreveport, La.

STANDARD drilling outfit, complete, A-1 condition. New Young 145 HP motor, new 5,000-foot wire lines, $8,500. L. A. Bolte, R. D. #2 Brunswick, Ohio. Phone W. Richfield 2423.

SEAMLESS MECHANICAL Steel Tubing, Hydraulic and Pressure Tubing available for prompt shipment. Send us your inquiries. Send us your list of surplus tubing, valves, etc. General Steel Products Co., 231 Healey Bldg., Atlanta, Georgia.

CABLE DRILLING EQUIPMENT. Deep and shallow well machines. Standard outfit with steel derrick. Complete line drilling and fishing tools. Cable and supplies. S. W. Pressey, Pueblo, Colorado.

STRING of cable tool seamless oil well casing. Approximately 5,000 ft. from 15" down to 6". Will sell below ceiling. Baden Equipment & Construction Co., 3303 Goodfellow Blvd., St. Louis, 20, Missouri.

FOR SALE: 55 Heavy Duty Wichita Falls Spudder, Center spool, new style reverse, chain driven sand reel, chain driven casing drum, high and low speed; Mast 52', 5 x 14, with Caterpillar motor #60, combination carburetor, all in good condition, priced to sell. W. W. Holmes, Box 567, Amarillo, Texas.

Caterpillar "35" Tractor equipped with Cardwell Side Boom, Completely Rebuilt. Caterpillar D-13000 Diesel Power Unit, Completely Rebuilt.
MARTIN TRACTOR CO., Chanute, Kansas.

FOR SALE: Good used #2, 3 conductor Reda Armored Elec. Cable, 675 Gal. Gasoline Tanks. Also misc. Army Supplies. L. Smith Co., 520 S.E. 29, Oklahoma City, Oklahoma. 3-4112.

FOR SALE: 2 model 18C Jenson Jacks with straight lift head, Complete; and model VIK Waukesha motor. 1 All steel spudder. McComas Oil Field Supply, Blackwell, Oklahoma.

FOR SALE: All steel building, excellent condition. 36 x 81 x 14. Near Enid, Oklahoma. Standing. Box B-109, The Oil and Gas Journal, Tulsa, Oklahoma.

**Chrome Tubing**
**New**

**79 Pcs. 3¼" I.D. x 4¼" O.D. x 25 Ft.**
**Our Price.....$2.25 Per Foot**
**New Price.....$3.25 Per Foot**

**PROCESS EQUIPMENT COMPANY**
**TORRANCE, CALIFORNIA**
**Phone: Los Angeles Pleasant 2-6366**

**FOR SALE**

**TUBES and PIPE**

all types and sizes

Write, wire or phone for quotations. Also motors, machinery and kindred items.

**SONKEN-GALAMBA Corporation**
Kansas City 16, Kans

EQUIPMENT FOR SALE

## FOR SALE

**Steam Rotary Drilling Rig, Complete. 7000′ 4½ full hole pipe. Hughes Acme Tool Joints. Three 125 H.P. Donovan Boilers. Oilwell draw works with Parkersburg Hydromatic Brake. 12 x 12 Ideal Ajax Engine. Two 14" x 7¼" x 18" Wilson Snyder Pumps. One 27½" Oilwell Oilbath Rotary Table. Schaffer blowout preventer. Link Belt shale shaker. 127′ Lee C. Moore derrick. 8′ Sub & Engine structure. Hard wood lumber for matting and floors. Approximately 2½ miles of 2½" line pipe. Two boilers feed pumps unitized on skids. Two generators. Two steel dog houses. Other equipment too numerous to mention. Priced to sell quick.**

**BENNETT BROTHERS DRILLING COMPANY**

**Telephone — Fannin 3358**

**SAN ANTONIO, TEXAS**

## FOR SALE

1—Power End consisting of #34-36 type B Ideal Drawworks with hydromatic brake; 1—36" Houston Portable Reverse Clutch; 3 type NKU 6 cylinder Waukesha engine; 1—type M Allis-Chalmers 3 engine compound.
1—5C3 Ideal Unitized drawworks with 36" Houston Portable Reverse Clutch.
1—36" Houston Portable Reverse Clutch.
1—87′ Lee C. Moore Jack Knife Cantilever Derrick, 300,000# capacity with 14′ x 30′ base.
2—Model 3B National Tank Butane Tanks 1640 gallon 125# pressure.
1—Model JL 1335 Buda Gas Engine 6¼ x 7¼ 185 Horse power at 1200 RPM with Twin Disc clutch and heavy oil field skids.
6—Portable pipeline pumping units figure No. 1860 Gaso 4½ x 6 enclosed V belted to model K 428 gasoline engine mounted on 6" steel skids.
1—7¼ x 14 Type B Ideal Power Pump with Surge Chamber, Sheave and Heavy Skids (Reconditioned 1—27½" Oil Well Oil Bath Rotary Table, reconditioned).
8,000′ of 6⅝ OD 6" ID 25.20# range 2, Youngstown seamless casing, priced at 85 cents per foot.

**H. A. McCARTHY**

310 Thompson Bldg. Tulsa (3), Oklahoma Telephone 5-3296

1—D40 Ideco Pumping Unit complete with FCU Waukesha Motor—$750.00. 3—D10 Jensen Pumping Units complete with FCU Waukesha Motors, Mounted on Steel Skids. $650.00 each. All Motors fully reconditioned, New Crankshafts, Bearings, etc. H. W. Beck, Phone 89, Grayville, Illinois.

FOR SALE: 10,000 ft. new 4½" O.D. 16.60# National SIUE Grade D Range 2 Drill Pipe with 6" O.D. x 3 ⅞" Bore Semi-Internal Flush Reed Supershrink Grip Tool Joints. Immediate delivery from stock. The National Supply Co., Fort Worth, Texas.

### TANK CARS

6—8 & 10,000 Gallons
offered at CUT prices

Inquiries Requested

**BROWN-STRAUSS CORP.**
P.O. Box 78 Kansas City 10, Mo.

### OIL TANKS — WATER TANKS — GRAIN TANKS

New bolted 250 bbl. High 500 bbl. Low 500 bbl. 1000 bbl., new 10,000 bbl. bolted, Government Surplus. Will erect any place within a thousand mile radius of Oklahoma.

Also complete stock of New Welded Steel Tanks, and used Tanks of all sizes.

**INDEPENDENT TANK COMPANY**
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Seminole, Oklahoma

## ETHYL PLANT

One—3250 gallon lead blending plant, complete with 30 ton scales weightograph; Goulds 5x4 centrifugal pump with 20 HP G. E. motor. All housed in 30x20 steel insulated building with 10′x10′ brick wash room. Located Lewiston, Mont.
For complete information, write, call or wire

**Brown-Strauss Corporation**

P.O. Box 78 Phone Ha. 1000
1548 Guinotte Ave Kansas City, Mo.

### FOR SALE

50— 500 Barrels
10— 1,000 Barrels
20— 5,000 Barrels
4—10,000 Barrels

Heavy A.P.I. New closed bolted type steel tanks located at Ogden, Utah. Can quote reasonable prices in order to move from present premises at once.

**JOS. GREENSPON'S SON PIPE CORP.**
National Stock Yards
St. Clair County, Ill.

EQUIPMENT FOR SALE

FRANKS MODEL 5000-L Truck Mounted Rotary Drilling Unit. This unit has been completely overhauled by Franks Manufacturing Company and can be had as a single unit or a complete drilling rig with motor driven 6¾ x 12 Ideal Pump and 4,000′ of 4½" drill pipe. Murray Tool & Supply Company, Beacon Building, Tulsa, Okla., Phone 4-0144.

FOR SALE: 2 RXIV Le Roi 8 Cylinder 6¾"x7" 225 HP. Engines completely overhauled with starting engines with or without twin disc clutches. Jack Gwynn Company, Ltd., Phone 6196, Wichita Falls, Texas.

DRILLING RIG for sale, capacity 5000 feet, 88 foot relegged derrick, 4500 feet drill stem, two steam boilers, tool house, complete equipment and many extras; very low price; all in good condition. Address P.O. Box 637, Eldorado, Arkansas.

FOR SALE: Drilling Equipment, National Machines, Cable Tools for shallow and deep drilling located at Bird-Hanley & Sheedy Camp on Highway 54, seven miles west of Yates Center, Kansas. Write Earl Orr, Toronto, Kansas.

1—20,000 barrel per day Diesel Engine Pump Station, consisting of 4 Units, complete with auxiliary machinery and in running condition. Box B-118, The Oil and Gas Journal, Tulsa, Oklahoma.

**ATTENTION STEAM RIG OWNERS**
We have at Oklahoma City a Two-Engine Power Hook-Up ALL NEW. Designed for converting from Steam Rig to Power Operation for 7500′ drilling, powered by Cummins Diesels. We will make liberal allowance for your steam equipment on purchase of this equipment.
**LUCEY PRODUCTS CORPORATION**
Tulsa, Oklahoma

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ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma

ACTION IN MONTANA! In the 44,000,000-barrel Cut Bank field, a new deep pay zone! In the 15,000,000-barrel Cat Creek field, a thousand-barrel gusher flowing 53-gravity oil from a new pay zone at 1,400 feet! There is ACTION in Montana, off the beaten path, with royalties available at low prices, ahead of the drill. Maps, information, FREE. Landowners Royalties Co., Box 1225, Great Falls, Montana.

A $250,000 Royalty Corporation has just been formed to operate mainly in the Anadarko Basin area of Western Oklahoma, and other fields. For full information, write: Anadarko Royalty Corporation, 504 Wilson Bldg., Dallas, Texas.

### FOR SALE—MAPS

## MAP FOR SALE

Geological Map covering the Gulf Coast of Texas, showing all new discoveries and all dry holes drilled to February 1, 1946. Dry holes show well elevations and all paleontological data. All oil fields are colored in green, gas fields in red, sulphur in purple, geophysical prospects in yellow and depleted fields in brown.

54 x 126 in. On paper, uncolored....$35.00
On linen, uncolored....$50.00
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For coloring add $15 (large size) and $5 (small size)

**Statewide Map Company**
1005 Isabella, Houston 4, Texas
Phone J27304

## HELP WANTED

WANTED: Mechanical Engineer thoroughly familiar with the design and manufacture of oilfield equipment. Give complete history of previous and present work, references, and salary expected. All replies will be kept confidential. Address Box A-949, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Chief Draftsman, by refinery in Mid-Continent area. Must be capable of managing drafting room and designing towers, furnaces, piping, structures and general refinery installations. Permanent position. Salary $350.00 State experience, education and qualifications. Box A-994, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER, preferably with refinery metal inspection experience, for position as pressure vessel designer with New York engineering firm. Opportunity for advancement. State educational background, practical experience and salary expected. Box B-108, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC PARTY CHIEF wanted by well-known established contracting company. Must be college graduate with at least five years' experience in interpretation preferably Gulf Coast. Excellent salary and opportunity. Only highly experienced applicants will be considered. Write Box B-107, The Oil and Gas Journal, Tulsa, Oklahoma.

COST ACCOUNTANT thoroughly familiar with refinery cost accounting. Must be capable of setting up at once and maintaining a cost accounting department for independent refinery. Give experience and salary expected. Box B-112, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: JUNIOR STRATIGRAPHER by Major Oil Company. Minimum requirements B.S. or B.A. degree, geology major with emphasis on paleontology. Higher degrees preferable. Experience not necessary. Write Box B-102, The Oil and Gas Journal, Tulsa, Okla.

WANTED: MINING, PETROLEUM, OR GEOLOGICAL ENGINEERS by Major Oil Company. M.S. or higher degrees required with major in geology or physics and mathematics. Preferably without experience. Write Box B-101, The Oil and Gas Journal, Tulsa, Okla.

WANTED: JUNIOR GEOPHYSICISTS by Large Major Oil Company. Minimum requirements B.S. or B.A. degree, physics or mathematics major. Advanced degrees preferable. Previous experience unnecessary. Write Box B-100, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: MECHANICAL ENGINEER. Major Oil Company requires graduate Mechanical Engineer for Production Department. Either experienced or inexperienced. Write Box A-800, The Oil and Gas Journal, Tulsa, Oklahoma.

**WANTED: MECHANICAL ENGINEER**

Technical graduate preferred, experienced in over-all refinery maintenance and repair of crude distillation units, thermal and catalytic cracking units, alkylation, absorption, fractionation, lube, asphalt, and high pressure steam boiler plants. Thorough knowledge of exchangers, pumps, turbines, compressors, pressure vessels, and piping and welding procedures. Give complete history of previous and present connection, age, education, experience, references, and minimum salary expected. Permanent position with major oil company located in Southern California.

**Box B, The Oil and Gas Journal**
1406 S. Grand Ave., Los Angeles 15, Calif.

## HELP WANTED

TWO DISTRICT SALESMEN by manufacturer of production equipment for Texas and Louisiana territories. Factory training, salary, expenses and car allowance. Helpful supervision and opportunity for advancement. Give qualifications and business experience with reply to Box A-984, The Oil and Gas Journal, Tulsa, Oklahoma.

**Land & Lease Negotiation**

Man capable of obtaining land permits and negotiating oil land leases for oil company in Venezuela. Must have thorough knowledge of Spanish and be familiar with Latin American people. Salary, depending on training and experience, to range from $600.00 to $750.00 a month plus living allowance. Please write full particulars to T-13, P.O. Box 3414, Philadelphia 22, Pennsylvania.

## SITUATIONS WANTED

CONFIDENTIAL OBSERVER and Trouble Shooter for former Secretary of the Navy Knox (in U. S. and Alaska) desires responsible position with progressive organization. Wide experience in all phases National Security, Human Relations, Business and Handling men. Age 36. Replies treated confidential. Box 4217, Tulsa 9, Oklahoma.

GRADUATE CHEMIST, age 27, five years refinery laboratory and plant experience. Desires position in petroleum or petrochemical industry. Box A-991, The Oil and Gas Journal, Tulsa, Oklahoma.

RESEARCH GEOLOGIST, 15 years' commercial experience, now employed routine work, available for applied research oil exploration. Box A-939, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY SUPERINTENDENT: Past 10 years in supervisory capacity. Familiar with thermal cracking, fluid cat, asphalt, gasoline blending, etc. Available soon. Box A-989, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH PARTY CHIEF, interested in foreign work. Eight years in business, party chief or seismologist since 1940. Age 28, family man, foreign background. Box A-998, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER: More than ten years' experience with oil and gas reserves with major oil company. Capable of organizing and maintaining complete reserve estimates and records. Box A-993, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Connection with oil company selling diesel and boiler fuel oil to industries in Wisconsin, Minnesota, North and South Dakota. C. P. Lowen, 3240 Oakland Ave., Minneapolis, Minnesota.

EX-NAVAL Officer — Graduate Engineer with 8 years oil field engineering and 7 years administration and management. Engineer or Executive Assistant. Independent producer preferred. Box B-104, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED TAX ATTORNEY familiar with the tax problems of the Oil Industry, wants connection with oil or drilling company. Veteran. Box A-992, The Oil and Gas Journal, Tulsa, Oklahoma.

POSITION WANTED as Sales Representative for Asphalts and Road Oils in the State of Wisconsin. Have had several years' experience in the bituminous road construction business. Box B-110, The Oil and Gas Journal, Tulsa, Okla.

CHIEF CHEMIST and Assistant Superintendent with over 10 years' broad experience in three large independent refineries desires new connection in South or Southwest. Age 36, responsible, excellent record of achievement, references, available immediately. Address Box B-113, The Oil and Gas Journal, Tulsa, Oklahoma.

## SITUATIONS WANTED

CONSTRUCTION SUPERINTENDENT. Graduate electrical and civil engineering. Knowledge Spanish and Portuguese. Experienced in heavy construction, refineries, chemical plants and power plants. Available immediately for foreign or domestic service. Box A-968, The Oil and Gas Journal, Tulsa, Oklahoma.

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CHEMIST—B. S. Degree. Two years laboratory and general refining; three years process control work in lube oil production. Wishes to make connections with progressive concern. Box B-115, The Oil and Gas Journal, Tulsa, Oklahoma.

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# ADVERTISERS IN THIS ISSUE


Aeroquip Corporation ..... 32
Air Reduction Sales Co. ..... 27
Allis Co., The Louis ..... 69, 70
Allis-Chalmers Mfg. Co. ..... 11
Aluminum Co. of America ..... 28
Aluminum Industries, Inc. ..... 98
American Body & Trailer Co. ..... 140
American Cyanamid & Chemical Corp. ..... 22
American Iron & Machine Works ..... 208
American Manufacturing Co. of Texas ..... 146
American Meter Company ..... 60, 61
American Rolling Mill Co., The ..... 118
American Steel & Wire Company ..... 13
Anderson Brothers ..... 198
Armstrong Bros. Tool Co. ..... 219

Babcock & Wilcox Co., The ..... 80, 81
Babcock & Wilcox Tube Co., The ..... 97
Badger & Sons Co., E. B. ..... 148, 149
Baker Oil Tools, Inc. ..... 106
Baldwin-Duckworth Division of Chain Belt Company ..... 51
Bank Street Trucking & Cooperage Co. ..... 190
Baroid Sales Division, National Lead Company ..... 16, 17
Bechtel Brothers McCone Co. ..... 33
Blackstone Hotel, The ..... 221
Bowser, Inc. ..... 184
Braden Winch Company ..... 76
Brewster Company, Inc., The ..... 159
Brown Company, Andrew ..... 63
Bruning Co., Inc., Charles ..... 25
Bucyrus-Erie Co. ..... 84
Byron Jackson Co. ..... 219, Front Cover

Cable & Stine ..... 204
Cameron Iron Works, Inc. ..... Inside Back Cover
Cardwell Mfg. Co., Inc. ..... 2
Caterpillar Tractor Co. ..... 6
Chemical Construction Corp. ..... 52
Chicago Bridge & Iron Company ..... 120, 121
Clark Brothers Company, Inc. ..... 74, 75
Classified Advertising ..... 223, 224, 225
Cleveland Trencher Company ..... 206
Columbia Steel Company ..... 13
Cooper, Fred E. ..... 154
Crutcher-Rolfs-Cummings ..... 122
Curtin & Co., Inc., W. H. ..... 213

Dallas Tank Company ..... 176
Davis Regulator Co. ..... 176
Day, Inc., Joseph P. ..... 170
Dayton Rubber Manufacturing Co. ..... 68
Dean Brothers Pumps, Inc. ..... 199
Derneal Supply Co. ..... 67
Diamond Chain & Mfg. Co. ..... 202
Dowell Incorporated ..... 104
Dresser Industries, Inc. ..... 34
Dresser Manufacturing Division ..... 18
Dugas Division of Ansul Chemical Co. ..... 209

du Pont ..... 137
Durbin-Durco ..... 204
Eagle-Picher Co., The ..... 177
East Texas Electric Steel Co., Ltd. ..... 33
Edward Valves, Inc. ..... 89
Emsco Derrick & Equipment Co. ..... 73
Engineers & Fabricators, Inc. ..... 138
Ensign Carburetor Company, Ltd. ..... 86
Falcon Products, Inc. ..... 188
Farris Engineering Co. ..... 82
First National Bank & Trust Co. of Tulsa, The ..... 207
Flexible Sewer-Rod Equipment Co. ..... 170
Floridin Company, Inc. ..... 166
Fluid Packed Pump Co. ..... 77
Foster Wheeler Corp. ..... 9, 10
Four Wheel Drive Auto Co., The ..... 53
Friden Calculating Machine Co., Inc. ..... 213
Gaso Pump & Burner Mfg. Co. ..... 8
General American Transportation Corporation ..... 160
General Controls ..... 175
General Paint Corporation ..... 214
Girdler Corporation, The ..... 125
Goode Equipment Co., Inc. ..... 205
Goodrich Company, B. F. ..... 3
Gott Mfg. Co., H. P. ..... 175
Goulds Pumps, Inc. ..... 169
Grancell, I. H. ..... 219
Grant Oil Tool Co. ..... 55
Graver Tank & Mfg. Co., Inc. ..... 99
Griscom-Russell Co., The ..... 91
Guiberson Corporation ..... 49

H & M Pipe Beveling Machine Co. ..... 197
Haering & Co., Inc., D. W. ..... 158
Hammond Iron Works ..... 134, 135
Hamner Company, Leland ..... 194
Harrisburg Steel Corporation ..... 211
Hill-Hubbell & Co. ..... 214
Houston Oil Field Material Co., Inc. ..... 21
Hughes Tool Co. ..... Back Cover
Hydril Co. ..... 50
Industrial Supply Co. ..... 187
International Harvester Co. ..... 132
J P Machine & Tool Co. ..... 185
Jarecki Manufacturing Co. ..... 68
Jessop Steel Co. ..... 187
Jones Motrola Corp. ..... 199
Kellett Aircraft Corp. ..... 102
Kennedy Valve Mfg. Co., The ..... 140
Keuffel & Esser Co. ..... 169
Kieley & Mueller, Inc. ..... 183
Kobe, Incorporated ..... 36
Koppers Co., Inc., American Hammered Piston Ring Division ..... 87
Ladish Drop Forge Co. ..... 173
Landis Machine Co., The ..... 5
Larkin Packer Company, The ..... 152
Le Roi Company ..... 168

Link-Belt Company ..... 12
Lufkin Foundry & Machine Co. ..... 78
Lummus Co., The ..... 95, 96
Lunkenheimer Co., The ..... 58
MacClatchie Manufacturing Co. ..... 79
Magnet Cove Barium Corp. ..... 181
Maloney Company, F. H. ..... 186
Marmon-Herrington Co., Inc. ..... 31
Martin-Decker Corp. ..... 20
Mayor, James E. ..... 198
Maxim Silencer Co., The ..... 7
McCall Corporation ..... 48
McCord Corporation ..... 194
McCullough Tool Company ..... 24
McKee & Company, Arthur G. ..... 15
Meletron Corporation ..... 167
Mercoid Corp., The ..... 180
Midwest Piping & Supply Co., Inc., The ..... 97
Minneapolis-Moline Power Implement Company ..... 183
Mission Mfg. Co., The ..... 179
Murray Rubber Company ..... 102, 103
National Airoil Burner Co., The ..... 166
National Bank of Tulsa ..... 93
National Supply Co., The ..... 64, 65
Naylor Pipe Company ..... 215
New Bedford Cordage Co. ..... 219
Norris Brothers, Inc. ..... 187
North American Geophysical Co. ..... 56
Norton Equipment Co., Inc. ..... 204

Oil Center Tool Co. ..... 101
Oil Lift Supply Co. ..... 216
Oil Well Supply Co. ..... 44
Oklahoma Contracting Co. ..... 197
Oliver Corp., The ..... 30
Otis Pressure Control, Inc. ..... 41
Owen Tool Company ..... 212

Pacific Pumps, Inc. ..... 29
Pacific Wire Rope ..... 35
Page Steel & Wire Division of American Chain & Cable Co. ..... 38
Parkersburg Rig & Reel Co. ..... 19
Patterson-Ballagh Corporation ..... 59, 221
Penberthy Injector Co. ..... 117, 210
Petroleum Electric Power Assn. ..... 85
Petroleum Engineering, Inc. ..... 156, 157
Pittsburgh Lectrodryer Corp. ..... 14
Portable Rig Division, Texas Iron Works ..... 150
Precision Scientific Co. ..... 82
Preformed Wire Rope Manufacturers, Information Bureau ..... 45
Price Company, H. C. ..... 163
Ratigan, J. P. ..... 88
Rector Well Equipment Co., Inc. ..... 4
Redbook ..... 48
Reed Roller Bit Company ..... 192, 193
Republic Steel Corporation ..... 47
Roebling's Sons Company, John A. ..... 130, 131
Schroeder Lumber Co., Alexander ..... 216
Seismic Exporations, Inc. ..... 43
Sheppard Company, R. H. ..... 170
Shrimpton Equipment Co. ..... 221
Smith Contracting Co. ..... 198
Smith Meter Co. ..... 46
Solar Aircraft Company ..... 92
Southern Mill & Mfg. Co. ..... 57
Southwest Machinery Co. ..... 204
Star Manufacturing Co. ..... 210
Stearns Roger Mfg. Co., The ..... 54
Stewart & Stevenson Services ..... 165
Sunshine Iron Works ..... 83

Taylor Forge & Pipe Works ..... 72
Templeton, Kenly & Co. ..... 213
Texas Electric Steel Casting Co. ..... 90
Texas Pipe Bending Co. ..... 194
Thomas Flexible Coupling Co. ..... 195
Thornhill-Craver Co. ..... 143
Timken Roller Bearing Company ..... 23
Tubbs Cordage Co. ..... 218
Twin Disc Clutch Co. ..... 40

Ultra Violet Products, Inc. ..... 189
Unit Rig & Equipment Company ..... Inside Front Cover
Universal Engineering Co. ..... 218

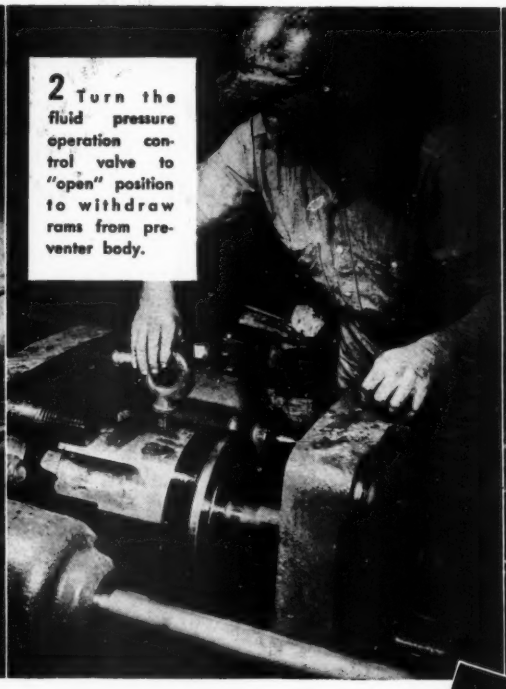
Vinson Supply Co. ..... 196
Vogt Machine Co., Henry ..... 26

Wailes Dove-Hermiston Corp. ..... 216
Walter Motor Truck Co. ..... 94
Walworth Co. ..... 1
Watson-Stillman Co., The ..... 42
Waukesha Motor Co. ..... 100
Western Felt Works ..... 199
Wheeling Machine Products Co. ..... 187
Wilson Manufacturing Co., Inc. ..... 145
Wilson Supply Co. ..... 71
Wisconsin Motor Corporation ..... 160
Wood River Oil & Refining Co., Inc. ..... 178
Wyatt Metal & Boiler Works ..... 174

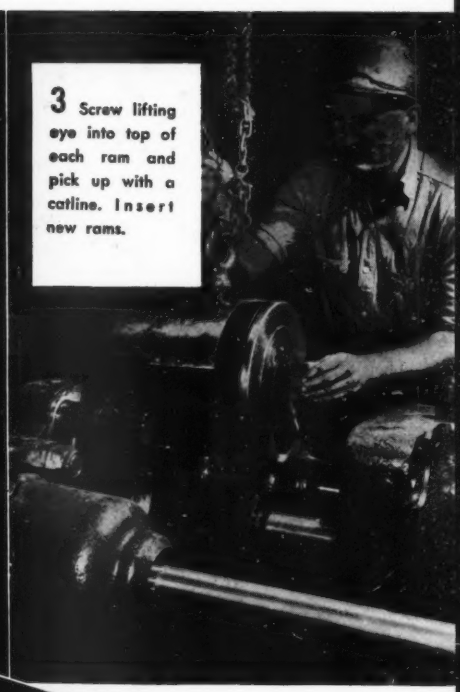
# Quick QRC Change

# THE ENTIRE OPERATION REQUIRES ONLY A FEW MINUTES!

**1** Remove 4 coarse thread wing nuts on each end of preventer. A few firm taps with a hammer spins them off.



**2** Turn the fluid pressure operation control valve to "open" position to withdraw rams from preventer body.



**3** Screw lifting eye into top of each ram and pick up with a catline. Insert new rams.

Any "oil field hand" who has ever changed a set of blowout preventer rams will find it hard to believe that the largest size rams can now be changed in a few minutes time . . . unless he is familiar with Cameron's new "QRC" model. Actually, the change requires only (1) the loosening of four hammer lug nuts on each bonnet, (2) turning a pressure control valve to "open" position, thus withdrawing the rams from the preventer body, and (3) lifting straight up on the rams with the catline. These simple operations in reverse order completes the ram change.

Of equal importance is the fact that the new "QRC" model provides an eight-to-one ratio of closing pressure to well pressure, that is, 1000 lbs. closing pressure will close the rams against approximately 8000 lbs. well pressure. This more favorable ratio is made possible by a unique by-pass on the lower side of the rams which diverts well pressure to the rear of the rams as an aid in closing.

In addition to these and other entirely new but proven mechanical features, the Cameron Type "QRC" Pressure-Operated Blowout Preventer makes generous use of features of earlier Cameron models, including the famous Cameron patented self-feeding ram packing element which permits pipe movement and/or rotation thru the closed rams while heavy mud is circulated to subdue "kicking" pressures.

Complete details will gladly be sent to interested operators on request.

• A double "QRC" hook-up on a West Texas wildcat.

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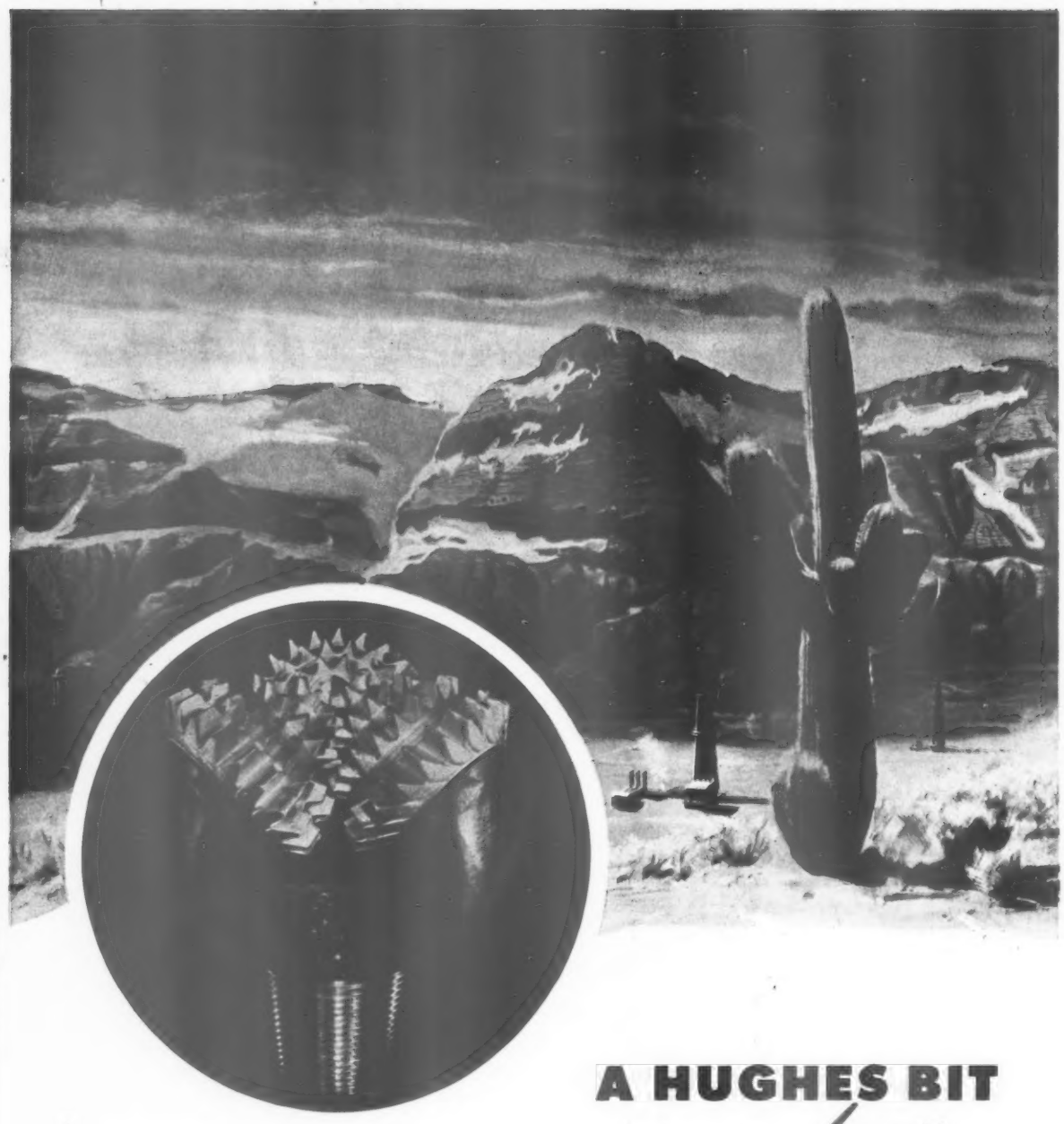
*Export:* 74 Trinity Place, New York, N. Y. *California:* The Howard Supply Co., Los Angeles. *Oklahoma:* 310 Thompson Bldg., Tulsa

711 MILBY STREET, HOUSTON, TEXAS



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